PB89-198816

Flexible Regional Emissions Data System (FREDS) Documentation for the 1985 NAPAP (National Acid Precipitation Assessment Program) Emissions Inventory

Alliance Technologies Corp., Bedford, MA

Prepared for:

Environmental Protection Agency, Research Triangle Park, NC

May 89

U.S. Department of Commerce
National Technical Information Service
NTIS

TECHNICAL REPORT DATA

(Please read Instructions on the reverse before completing)

1. REPORT NO.
EPA-600/9-89-047

2.

3. RECIPIENT'S ACCESSION NO.
PB89 198816/AS

4. TITLE AND SUBTITLE
Flexible Regional Emissions Data System (FREDS) Documentation for the 1985 NAPAP Emissions Inventory

5. REPORT DATE
May 1989

6. PERFORMING ORGANIZATION CODE

7. AUTHOR(S)
Lysa G. Modica, Danial R. Dulleba, Robert A. Walters, and John E. Langstaff

8. PERFORMING ORGANIZATION REPORT NO.
TRC-A87-342

9. PERFORMING ORGANIZATION NAME AND ADDRESS
Alliance Technologies Corporation
213 Burlington Road
Bedford, Massachusetts 01730

10. PROGRAM ELEMENT NO.

11. CONTRACT/GRANT NO.
68-02-4274, Tasks 7, 24, and 35

12. SPONSORING AGENCY NAME AND ADDRESS
EPA, Office of Research and Development
Air and Energy Engineering Research Laboratory
Research Triangle Park, NC 27711

13. TYPE OF REPORT AND PERIOD COVERED
Task Final; 1-6/88

14. SPONSORING AGENCY CODE
EPA/600/13

15. SUPPLEMENTARY NOTES
AEERL project officer is Robert C. Lagemann, Mail Drop 62, 919/541-2709.

16. ABSTRACT

The report documents the Flexible Regional Emissions Data System (FREDS) for the 1985 NAPAP Emissions Inventory. FREDS extracts emissions data, modeling parameters (e.g., stack height, exhaust gas temperature), and source identification information from point/area source NEDS data, and applies temporal, spatial, and pollutant species allocation factors to derive a gridded, speciated, and temporally resolved emissions file for input to regional scale atmospheric simulation models (e.g., the Regional Acid Deposition Model and Regional Oxidant Model). FREDS consists of seven modules that reformat the data, apply allocation factors to the annual emissions data, and ensure the quality of FREDS output. In addition to FREDS, peripheral software is used to maintain the allocation factor files. Separate programs are used to process point/area sources. The seven modules are the Hydrocarbon Preprocessor, the Quality Control Module, the Model Data Extraction Module, the Temporal Allocation Module, the Speciation Module, the Spatial Allocation Module, and the Model Input Preprocessor. Many of the modules can be implemented in a logical sequence or independently of the others in most cases. For maximum flexibility, FREDS allows the user to define and assign emissions of up to 15 pollutants prior to speciation, the temporal scenario, and other variables.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution	Pollution Control	13B
Emission	Stationary Sources	14G
Information Systems	FREDS	09B, 05B
Inventories	Acid Rain	15E
Precipitation (Meteorology)		04B

18. DISTRIBUTION STATEMENT **Release to Public**	19. SECURITY CLASS *(This Report)* **Unclassified**	21. NO. OF PAGES 577
	20. SECURITY CLASS *(This page)* **Unclassified**	22. PRICE

PB89-198816

EPA-600/9-89-047
May 1989

FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS) DOCUMENTATION FOR THE 1985 NAPAP EMISSIONS INVENTORY

by

Lysa G. (Lebowitz) Modica
Daniel R. Dulleba
Robert A. Walters
John E. Langstaff

Alliance Technologies Corporation
213 Burlington Road
Bedford, Massachusetts 01730

EPA Contract No. 68-02-4274
Work Assignments No. 7, 24, and 35

Robert C. Lagemann, EPA Project Officer
Air and Energy Engineering Research Laboratory
U.S. Environmental Protection Agency
Research Triangle Park, North Carolina 27711

This study was conducted in cooperation with the
National Acid Precipitation Assessment Program

AIR AND ENERGY ENGINEERING RESEARCH LABORATORY
OFFICE OF RESEARCH AND DEVELOPMENT
U.S. ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

N O T I C E

THIS DOCUMENT HAS BEEN REPRODUCED FROM THE BEST COPY FURNISHED US BY THE SPONSORING AGENCY. ALTHOUGH IT IS RECOGNIZED THAT CERTAIN PORTIONS ARE ILLEGIBLE, IT IS BEING RELEASED IN THE INTEREST OF MAKING AVAILABLE AS MUCH INFORMATION AS POSSIBLE.

NOTICE

This document has been reviewed in accordance with U.S. Environmental Protection Agency policy and approved for publication. Mention of trade names or commercial products does not constitute endorsement or recommendation for use.

ABSTRACT

This report documents the Flexible Regional Emissions Data System (FREDS) for the 1985 NAPAP Emissions Inventory. FREDS extracts emissions data, pertinent modeling parameters (e.g., stack height, exhaust gas temperature, etc.) and source identification information from point and area source data (contained in preprocessed SAS files) and applies appropriate temporal, spatial, and pollutant species allocation factors to derive a gridded, speciated, and temporally resolved emissions file suitable as input to regional scale atmospheric simulation models (such as the Regional Acid Deposition Model and Regional Oxidant Model). FREDS consists of seven modules which are used to reformat the data, apply allocation factors to the annual emissions data, and ensure the quality of FREDS output. In addition to FREDS, peripheral software is used to maintain the allocation factor files. Separate programs are used to process point and area sources. The seven modules are the Hydrocarbon Preprocessor (HCPREP), the Quality Control Module (QCM), the Model Data Extraction Module (MDEM), the Temporal Allocation Module (TAM), the Speciation Module (SM), the Spatial Allocation Module (SAM), and the Model Input Preprocessor (MIP). Many of the modules can be implemented in a logical sequence or independently of the others in most cases. To maximize flexibility, FREDS allows the user to define and assign emissions of up to 15 pollutants prior to speciation, the temporal scenario, spatial grid origin and grid cell size, and the number and relationship of pollutant subspecies. FREDS modules are written in the SAS language and are installed on the EPA National Computer Center IBM 3090.

CONTENTS

Abstract ii
Tables v
Figures. v
Acknowledgments vi
Executive Summary 1
Glossary of Acronyms and Abbreviations 6

1. Introduction 8
    Background 9
    Project Summary 9
    FREDS Overview 11
    Objectives 13
    Report Organization 13
2. System Charts 14
    FREDS--Point Sources 16
    FREDS--Area Sources 19
3. Detailed Program Description 22
    Hydrocarbon Preprocessor 24
    Quality Control Module 34
    Model Data Extraction Module 84
    Temporal Allocation Module 108
    Speciation Module 131
    Spatial Allocation Module 161
    Model Input Preprocessor 177
4. Input/Output Format Descriptions 190
    Hydrocarbon Preprocessor 192
    Quality Control Module 203
    Model Data Extraction Module 217
    Temporal Allocation Module 231
    Speciation Module 256
    Spatial Allocation Module 283
    Model Input Preprocessor 303
5. Control Statements 324
    Hydrocarbon Preprocessor 326
    Quality Control Module 328
    Model Data Extraction Module 331

CONTENTS (continued)

5. (cont.)
Temporal Allocation Module 334
Speciation Module 340
Spatial Allocation Module 343
Model Input Preprocessor 346
6. Operating Instructions 351
User Supplied Data 352
Error Messages 352
Summary Statistics 359
User Warnings/Considerations 364
7. Environment 366
Hydrocarbon Preprocessor 368
Quality Control Module 369
Model Data Extraction Module 370
Temporal Allocation Module 371
Speciation Module 373
Spatial Allocation Module 374
Model Input Preprocessor 375
8. Example Speciation Module Run and Description 376
Control Options File 378
Execution Deck 379
Output 381
9. References 410

Appendices

A. Hydrocarbon Preprocessor Source Code A-1
B. Quality Control Module Source Code B-1
C. Model Data Extraction Module Source Code C-1
D. Temporal Allocation Module Source Code D-1
E. Speciation Module Source Code E-1
F. Spatial Allocation Module Source Code F-1
G. Model Input Preprocessor Source Code G-1
H. Definition of Parameters and Code Listings. H-1
I. FREDS Modifications for Canadian Data Processing I-1
J. FREDS Modifications for Natural Sources Data Processing J-1

TABLES

Number Page

1-1 1985 NAPAP Emissions Inventory Coverage 10

FIGURES

Number Page

1-1 Simplified diagram of FREDS processing 12

3-1 The 1985 NAPAP grid system 162

3-2 Sample SAS program for resolving point source emissions. . . 178

4-1 HCPREP Sample "detailed" diagnostic report 202

4-2 Sample Quality Control Module national totals diagnostic error report. 213

4-3 Sample Quality Control Module state totals diagnostic error report. 214

4-4 Sample Quality Control Module SCC totals diagnostic error report. 215

4-5 Sample Quality Control Module temporal allocation factor diagnostic error report. 216

4-6 MDEM sample "detailed" diagnostic report - point sources . . 229

4-7 MDEM sample "totals" diagnostic report - area sources . . . 230

4-8 TAM sample "detailed" diagnostic report - point sources. . . 249

4-9 TAM sample "detailed" diagnostic report - area sources . . . 255

4-10 SM sample "detailed" diagnostic report - point sources . . . 279

4-11 SM sample "detailed" diagnostic report - area sources. . . . 280

4-12 SAM sample "detailed" diagnostic report - point sources. . . 299

4-13 SAM sample "detailed" diagnostic report - area sources . . . 301

4-14 MIP sample "totals" diagnostic report - area sources 323

ACKNOWLEDGMENTS

This report describes the development of the Flexible Regional Emissions Data System, a project administered by the U.S. Environmental Protection Agency (EPA) with funding from the National Acid Precipitation Assessment Program (NAPAP) Task Group on Emissions and Controls. Denise Swink of the U.S. Department of Energy serves as chairman of this task group, and Edward C. Trexler (DOE) serves as deputy chairman.

The project has been a cooperative effort involving personnel from both the EPA Office of Research and Development (ORD) and the EPA Office of Air Quality Planning and Standards (OAQPS). Donald Neal and Andrew Ackerman were primarily responsible for the design and coding of the original FREDS software. Enhancements and additions to the original FREDS code resulting in the FREDS software for the 1985 NAPAP inventory were designed and coded by Daniel Dulleba, David Fratt, John Langstaff, Lysa (Lebowitz) Modica, Daniel Mudgett, and Robert Walters. In addition, Joan Novak of EPA's Atmospheric Research and Exposure Assessment Laboratory provided valuable support and guidance.

EXECUTIVE SUMMARY

BACKGROUND

The National Acid Precipitation Assessment Program (NAPAP) was established by Congress in 1980 to coordinate and expand research on problems posed by acid deposition in and around the United States. The program is managed through the Interagency Task Force on Acid Precipitation which currently coordinates seven task groups having specific technical responsibilities. The Task Group on Emissions and Controls is charged with development of comprehensive and accurate inventories of emissions from anthropogenic and natural sources thought to be important in acid deposition processes. To fulfill its stated objective and to support other related NAPAP research, the Task Group on Emissions and Controls is generating a number of major emissions data bases using 1980 and 1985 as base years.

Processing of the 1980 NAPAP Emissions Inventories required the design of an emissions data handling system - the Flexible Regional Emissions Data System (FREDS)[1]. To meet the needs of the 1985 NAPAP Emissions Inventories, several modifications to the 1980 FREDS software were required. Enhancements to FREDS for the 1985 inventory processing included revisions to existing source code as well as the creation of two new software modules. This document describes the operation of FREDS as used to process Version 2 of the 1985 NAPAP inventory.

The primary focus of the NAPAP inventories is the fulfillment of the emissions data requirements for development and testing of the Regional Acid Deposition Model (RADM). In addition, emissions data are also used to support applications of the Regional Oxidant Model (ROM). To support development and testing of these models, the 1985 Annual Inventory is resolved temporally, spatially, and by component species using the Flexible Regional Emissions Data System. The temporal, spatial, and species resolution of the emissions data bases are summarized in the accompanying table. Annual emissions are allocated to the hourly level for a typical weekday, Saturday, and Sunday in each season (12 temporal scenarios); county-level area sources and major and minor point sources are spatially resolved to modeling grid cells; TSP emissions are assigned to alkalinity and size classes; NO_x emissions are split into NO and NO_2 constituents; and THC emissions are apportioned into approximately 32 photochemical reactivity classes.

To create the NAPAP Modeling Emissions Inventories, FREDS requires input files of temporal, spatial, and pollutant species allocation factors. The development of these factors is documented in separate reports.

1985 NAPAP EMISSIONS INVENTORY COVERAGE

	Annual Emissions Inventory	Regional Modeling Emissions Inventory
Geographic Domain	48 contiguous states and part of Canada	48 contiguous states and part of Canada
Pollutants	SO_2, SO_4, TSP, CO, NO_x, NH_3, VOC, THC	SO_2, SO_4, TSP (reactive Ca, Mg, K, Na: 0-2.5 microns, 2.5-10 microns, and total; TSP: 0-2.5, 2.5-6, and 6-10 microns.), CO, NO, NO_2, NH_3, VOC, THC (Methane, Ethane, Propane, Alkanes reactivity1, Alkanes reactivity2, Alkanes reactivity3, Alkanes reactivity4, Alkane/Aromatic Mix, Ethene, Propene, Alkenes Primary, Alkenes Internal, Alkenes Prim/Int Mix, Benzene/Halobenzenes, Aromatics reactivity1, Aromatics reactivity2, Phenols/Cresols, Styrenes, Formaldehyde, Higher Aldehydes, Acetone, Higher Ketones, Organic Acids, Acetylene, Haloalkenes, Unreactive, Others reactivity1, Others reactivity2, Others reactivity3, Others reactivity4, Unidentified, Unclassified)
Anthropogenic point sources	Stationary sources emitting greater than or equal to 100 tons of criteria pollutants at the plant level in 1985	
Anthropogenic area sources	County-level area sources and stationary sources emitting less than 100 tons of criteria pollutants in 1985	
Natural area sources	Emissions of TSP and alkaline particulates from natural and non process sources	
Temporal resolution	Annual	Hourly emissions values for typical weekday, Saturday, and Sunday for all four seasons
Spatial resolution	Point source locations specified by latitude and longitude; area sources at the county level	Point and area sources assigned to 1/4° longitude by 1/6° latitude grid cells

FREDS OVERVIEW

The Flexible Regional Emissions Data System is a software system designed to produce an emissions inventory suitable for input to regional acid deposition models. FREDS extracts emissions data, pertinent modeling parameters (e.g., stack height, exhaust gas temperature, etc.) and source identification information from point and area source data (NEDS data for 1985 NAPAP) contained in preprocessed SAS files and applies appropriate temporal, spatial, and pollutant species allocation factors to derive a gridded, speciated, and temporally-resolved emissions file. FREDS for the 1985 NAPAP Emissions Inventory consists of seven modules which are used to reformat the data, apply allocation factors to the annual emissions data, and ensure the quality of FREDS output. In addition to FREDS, peripheral software is used to maintain the allocation factor files. Separate programs are used to process point and area sources. The seven modules are the Hydrocarbon Preprocessor (HCPREP), the Quality Control Module (QCM), the Model Data Extraction Module (MDEM), the Temporal Allocation Module (TAM), the Speciation Module (SM), the Spatial Allocation Module (SAM), and the Model Input Preprocessor (MIP). For final processing, the SAS-formatted MIP output is converted to EBCDIC or ASCII characters. An overview of FREDS modules is presented in the accompanying figure. To maximize flexibility, FREDS allows user definition of up to 15 pollutant emissions and their identities, (referenced by Storage and Retrieval of Aerometric Data (SAROAD) pollutant code), the temporal scenario, spatial grid origin and grid cell size, and the number and relationship of pollutant subspecies. Grid definition is specified in a user-generated Control Options File. To speciate emissions for various chemical mechanisms or pollutant subclasses, the user inputs the requested classes using files containing the desired speciation factors. For processing of Canadian and natural source data, modifications to the FREDS code were required. These are discussed in Appendices I and J. FREDS modules are written in the SAS language and are installed on the National Computer Center's IBM 3090.

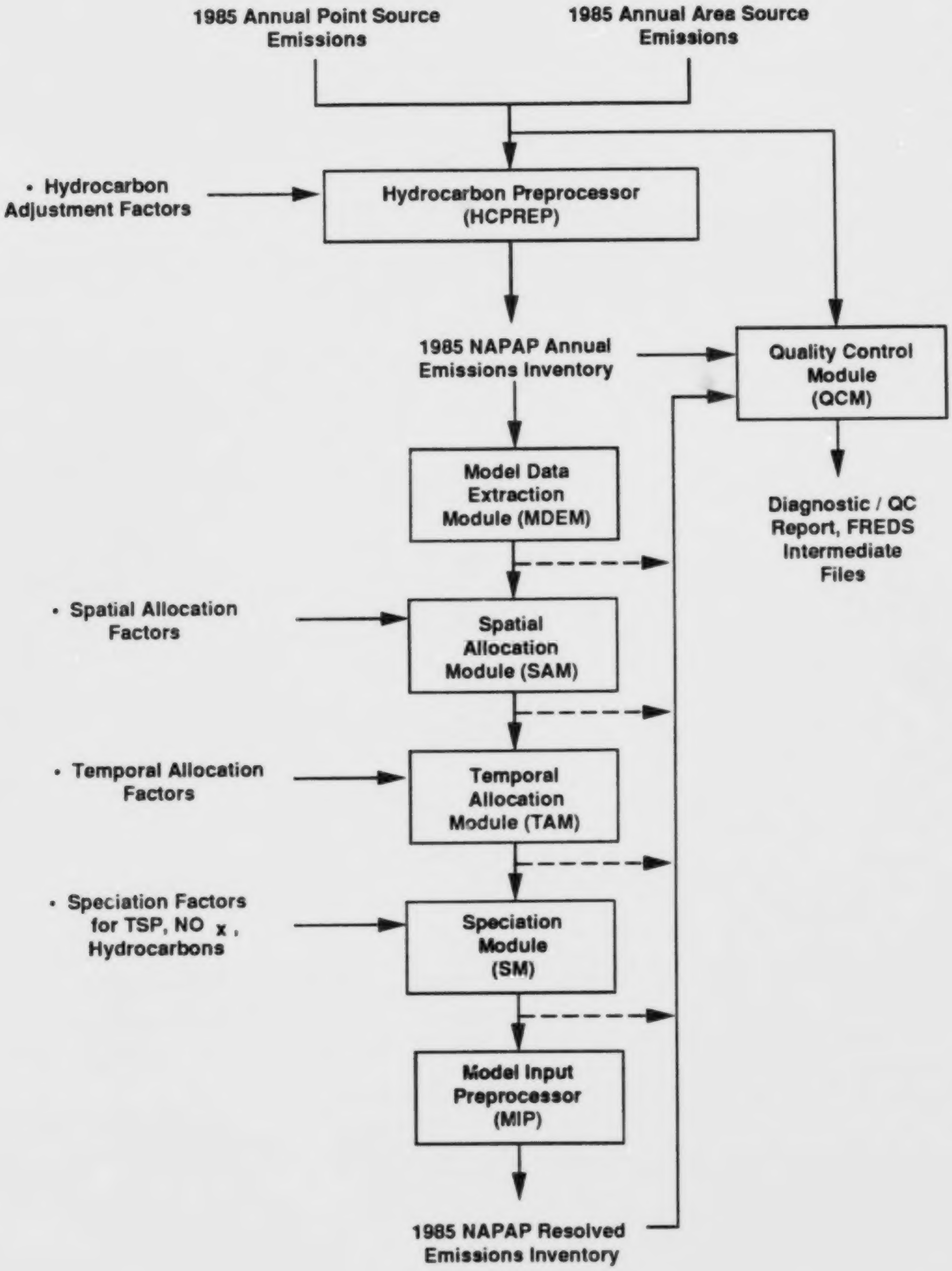
OBJECTIVES

The primary objectives of this report are to document the implementation of FREDS software for the development of the 1985 NAPAP Emissions Inventories and to provide the user with the necessary specifications for execution of FREDS modules. Input/Output formats are also supplied for all files based on the module executions presented in Section 2. Allocation factor development has been documented in several reports including "National Acid Precipitation Assessment Program Emission Inventory Allocation Factors",[2] and "Documentation of Spatial Allocation Procedures for the 1980 NAPAP Emissions Inventory".[3] Interested readers should refer to these documents.

REPORT ORGANIZATION

This report is comprised of the following sections:

- Introduction
- System Charts


1985 Annual Point Source Emissions
1985 Annual Area Source Emissions
• Hydrocarbon Adjustment Factors
Hydrocarbon Preprocessor (HCPREP)
1985 NAPAP Annual Emissions Inventory
Quality Control Module (QCM)
Diagnostic / QC Report, FREDS Intermediate Files
Model Data Extraction Module (MDEM)
• Spatial Allocation Factors
Spatial Allocation Module (SAM)
• Temporal Allocation Factors
Temporal Allocation Module (TAM)
• Speciation Factors for TSP, NO x, Hydrocarbons
Speciation Module (SM)
Model Input Preprocessor (MIP)
1985 NAPAP Resolved Emissions Inventory

Simplified diagram of FREDS processing.

REPORT ORGANIZATION (Continued)

- Detailed Program Description
- Input/Output Format Description
- Control Statements
- Operating Instructions
- Environment
- Example Speciation Module Run and Description.

CONCLUSION

FREDS software provides versatile and powerful computer programs to allocate emission inventory data into various levels of spatial, temporal, and species resolution. The system was used successfully in a first of a kind application to process the 1980 NAPAP Emissions Inventory into data bases to support the specific requirements of acid deposition and photochemical oxidant atmospheric models.[4] For use with the 1985 NAPAP emissions data base, several enhancements and modifications were implemented to allow for new and expanded data requirements, to improve processing efficiency, and to provide higher quality output data. The documentation of these programs in accordance with EPA's automatic data processing standards ensures that it will be a useful tool for future applications, including the production of modeler's tapes for historical and future emissions estimates.

GLOSSARY OF ACRONYMS AND ABBREVIATIONS

AQCR - Air Quality Control Region
COF - Control Options File
FREDS - Flexible Regional Emissions Data System
GMT - Greenwich Mean Time
HCPREP - Hydrocarbon Preprocessor
JCL - Job Control Language
MDEM - Model Data Extraction Module
MIP - Model Input Preprocessor
NEDS - National Emissions Data System
NCC - National Computer Center
PSPLIT - Pollutant Splits System
QCM - Quality Control Module
RADM - Regional Acid Deposition Model
ROM - Regional Oxidant Model
SAF - Spatial Allocation Factor
SAFF - Spatial Allocation Factor File
SAFP - Spatial Allocation Factor Preprocessor
SAM - Spatial Allocation Module
SAROAD - Storage and Retrieval of Aerometric Data
SCC - Source Classification Code
SFF - Speciation Factor File
SIC - Standard Industrial Classification
SM - Speciation Module
SSF - Surrogate Selection File
TAF - Temporal Allocation Factor
TAFF - Temporal Allocation Factor File
TAFP - Temporal Allocation Factor Preprocessor
TAM - Temporal Allocation Module
TZF - Time Zone File

SECTION 1

INTRODUCTION

BACKGROUND

The National Acid Precipitation Assessment Program (NAPAP) was established by Congress in 1980 to coordinate and expand research on problems posed by acid deposition in and around the United States. The program is managed through the Interagency Task Force on Acid Precipitation which currently coordinates seven task groups having specific technical responsibilities. The Task Group on Emissions and Controls is charged with development of comprehensive and accurate inventories of emissions from anthropogenic and natural sources thought to be important in acid deposition processes. To fulfill its stated objective and to support other related NAPAP research, the Task Group on Emissions and Controls is generating a number of major emissions data bases using 1980 and 1985 as the base years.

Processing of the 1980 NAPAP Emissions Inventories required the design of an emissions data handling system - the Flexible Regional Emissions Data System (FREDS). To meet the needs of the 1985 NAPAP Emissions Inventories, several modifications to the FREDS software were required. Enhancements to the FREDS source code for the 1985 inventory processing are reflected in this document.

PROJECT SUMMARY

The primary focus of the NAPAP Emissions Inventories is the fulfillment of the emissions data requirements for development and testing of the Regional Acid Deposition Model (RADM). Within EPA's Office of Research and Development, the Atmospheric Research and Exposure Assessment Laboratory (AREAL) has been assigned lead responsibility for developing the RADM. The National Center for Atmospheric Research (NCAR) and the State University of New York at Albany have been assigned the task of developing the model framework which includes a number of chemical transformation modules. In addition, emissions data are also used to support applications of the Regional Oxidant Model (ROM).

To support development and testing of these models, one of the most extensive applications of the NAPAP Emissions Inventories, the annual inventory is resolved temporally, spatially, and by component species to create modeling emissions inventories. The temporal, spatial, and species resolution of the emissions data bases are summarized in Table 1-1. Annual emissions are allocated to the hourly level for a typical weekday, Saturday, and Sunday in each season (12 temporal scenarios); county-level area sources and major and minor point sources are spatially resolved to modeling grid cells; TSP emissions are assigned to alkalinity and size classes; NO_x emissions are split into NO and NO_2 constituents; and THC emissions are apportioned into approximately 32 photochemical reactivity classes.

TABLE 1-1. 1985 NAPAP EMISSIONS INVENTORY COVERAGE

	Annual Emissions Inventory	Regional Modeling Emissions Inventory
Geographic Domain	48 contiguous states and part of Canada	48 contiguous states and part of Canada
Pollutants	SO_2, SO_4, TSP, CO, NO_x, NH_3, VOC, THC	SO_2, SO_4, TSP (reactive Ca, Mg, K, Na: 0-2.5 microns, 2.5-10 microns, and total; TSP: 0-2.5, 2.5-6, and 6-10 microns.), CO, NO, NO_2, NH_3, VOC, THC (Methane, Ethane, Propane, Alkanes reactivity1, Alkanes reactivity2, Alkanes reactivity3, Alkanes reactivity4, Alkane/Aromatic Mix, Ethene, Propene, Alkenes Primary, Alkenes Internal, Alkenes Prim/Int Mix, Benzene/Halobenzenes, Aromatics reactivity1, Aromatics reactivity2, Phenols/Cresols, Styrenes, Formaldehyde, Higher Aldehydes, Acetone, Higher Ketones, Organic Acids, Acetylene, Haloalkenes, Unreactive, Others reactivity1, Others reactivity2, Others reactivity3, Others reactivity4, Unidentified, Unclassified)
Anthropogenic point sources	Stationary sources emitting greater than or equal to 100 tons of criteria pollutants at the plant level in 1985	
Anthropogenic area sources	County-level area sources and stationary sources emitting less than 100 tons of criteria pollutants in 1985	
Natural area sources	Emissions of TSP and alkaline particulates from natural and non process sources	
Temporal resolution	Annual	Hourly emissions values for typical weekday, Saturday, and Sunday for all four seasons
Spatial resolution	Point source locations specified by latitude and longitude; area sources at the county level	Point and area sources assigned to 1/4° longitude by 1/6° latitude grid cells

To create the NAPAP Modeling Emissions Inventories, temporal, spatial, and pollutant species allocation factors were developed and applied to the annual data base. Allocation factor development has been documented in "National Acid Precipitation Assessment Program Emission Inventory Allocation Factors",[2] and "Documentation of Spatial Allocation Procedures for the 1980 NAPAP Emissions Inventory".[3] Interested readers should refer to these documents, as allocation factor development will not be covered by this report.

FREDS OVERVIEW

The Flexible Regional Emissions Data System (FREDS) is a software system designed to produce an emissions inventory suitable for input to regional acid deposition models. FREDS extracts emissions data, pertinent modeling parameters (e.g., stack height, exhaust gas temperature, etc.) and source identification information from point and area source data (NEDS data for 1985 NAPAP) contained in preprocessed SAS files and applies appropriate temporal, spatial, and pollutant species allocation factors to derive a gridded, speciated, and temporally resolved emissions file. FREDS for the 1985 NAPAP Emissions Inventory consists of seven modules which are used to reformat the data, apply allocation factors to the annual emissions data, and ensure the quality of FREDS output. In addition to FREDS, peripheral software is used to maintain the allocation factor files. Separate programs are used to process point and area sources. The seven processing modules are the Hydrocarbon Preprocessor (HCPREP), the Quality Control Module (QCM), the Model Data Extraction Module (MDEM), the Temporal Allocation Module (TAM), the Speciation Module (SM), the Spatial Allocation Module (SAM), and the Model Input Preprocessor (MIP). For final processing, the SAS-formatted MIP output is converted to EBCDIC or ASCII characters. An overview of FREDS modules is presented in Figure 1-1. Each of the allocation modules can be implemented in a logical sequence or independently of the others. To maximize flexibility, FREDS allows user definition of up to 15 pollutant emissions and their identities (referenced by SAROAD code), the temporal scenario, spatial grid origin and grid cell size, and the number and relationship of pollutant subspecies. Grid definition is specified in a user generated Spatial Allocation Module Control Options File. To speciate emissions for various chemical mechanisms or pollutant subclasses, the user inputs the requested classes using files containing the desired speciation factors. FREDS modules are written in the SAS language and are installed on the National Computer Center's IBM 3090.

For FREDS processing of Canadian and natural source data, modifications were made to several modules to account for different data requirements and peripheral file formats. For example, the Canadian emissions files did not contain county-level emissions; therefore, the variable COUNTY had to be removed from FREDS software to process the Canadian data. A complete discussion of these modifications are included in Appendices I and J.

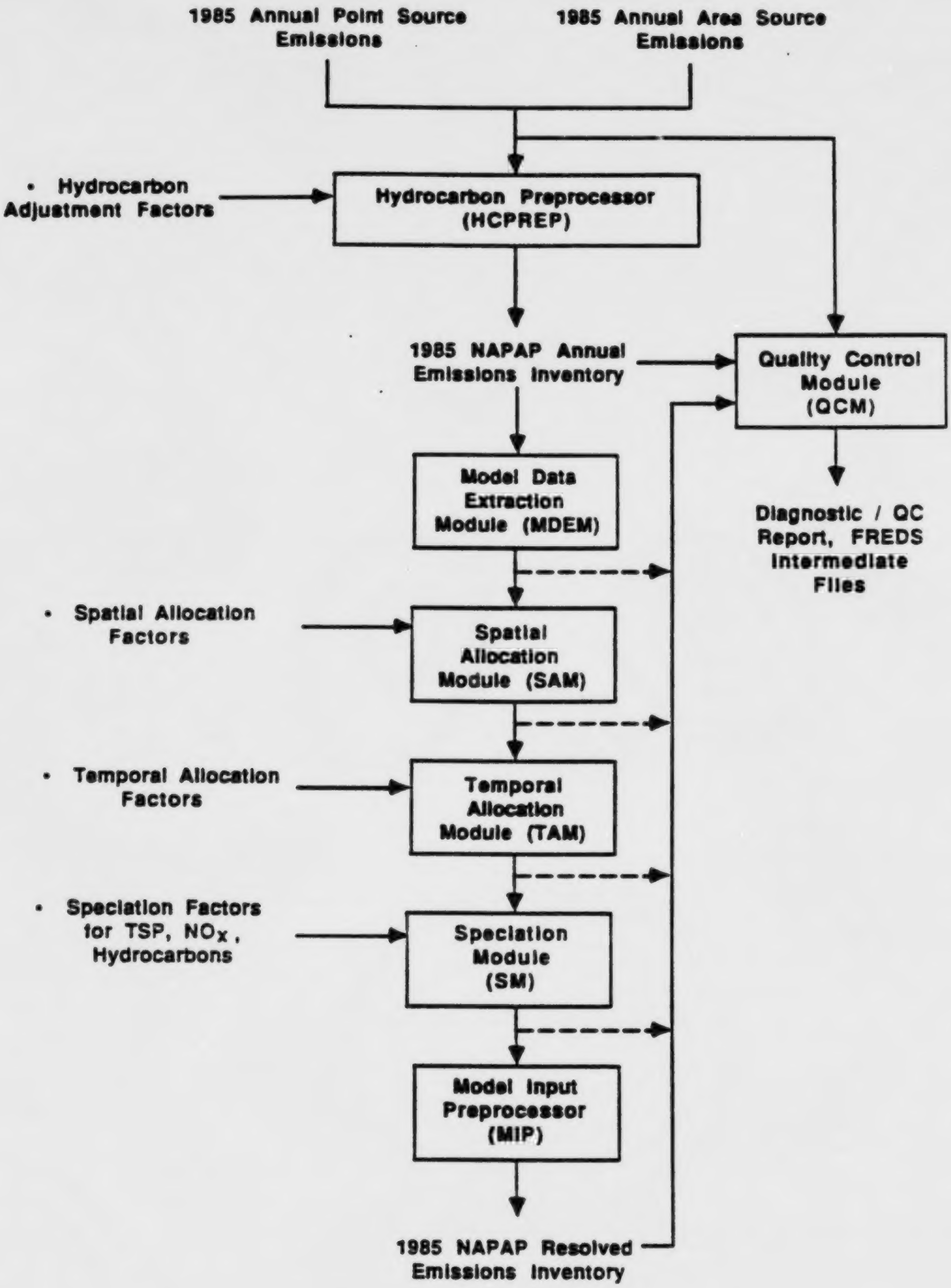

1985 Annual Point Source Emissions
1985 Annual Area Source Emissions
• Hydrocarbon Adjustment Factors
Hydrocarbon Preprocessor (HCPREP)
1985 NAPAP Annual Emissions Inventory
Quality Control Module (QCM)
Diagnostic / QC Report, FREDS Intermediate Files
Model Data Extraction Module (MDEM)
• Spatial Allocation Factors
Spatial Allocation Module (SAM)
• Temporal Allocation Factors
Temporal Allocation Module (TAM)
• Speciation Factors for TSP, NOx, Hydrocarbons
Speciation Module (SM)
Model Input Preprocessor (MIP)
1985 NAPAP Resolved Emissions Inventory

Figure 1-1. Simplified diagram of FREDS processing.

OBJECTIVES

The primary objectives of this report are to document the implementation of FREDS software for the development of the 1985 NAPAP Emissions Inventories and to provide the user with the necessary specifications for execution of FREDS modules. Input/Output formats are also supplied for all files based on the module executions presented in Section 2.

REPORT ORGANIZATION

The report is organized using the following guidelines:

- EPA Management Information and Data Systems Division Automated Data Processing System Documentation
- AEERL-Office of Research and Development Handbook for Report Preparation
- OAQPS-National Air Data Branch Documentation Standards.

Based on the above guidelines, the remainder of this document is comprised of the following sections:

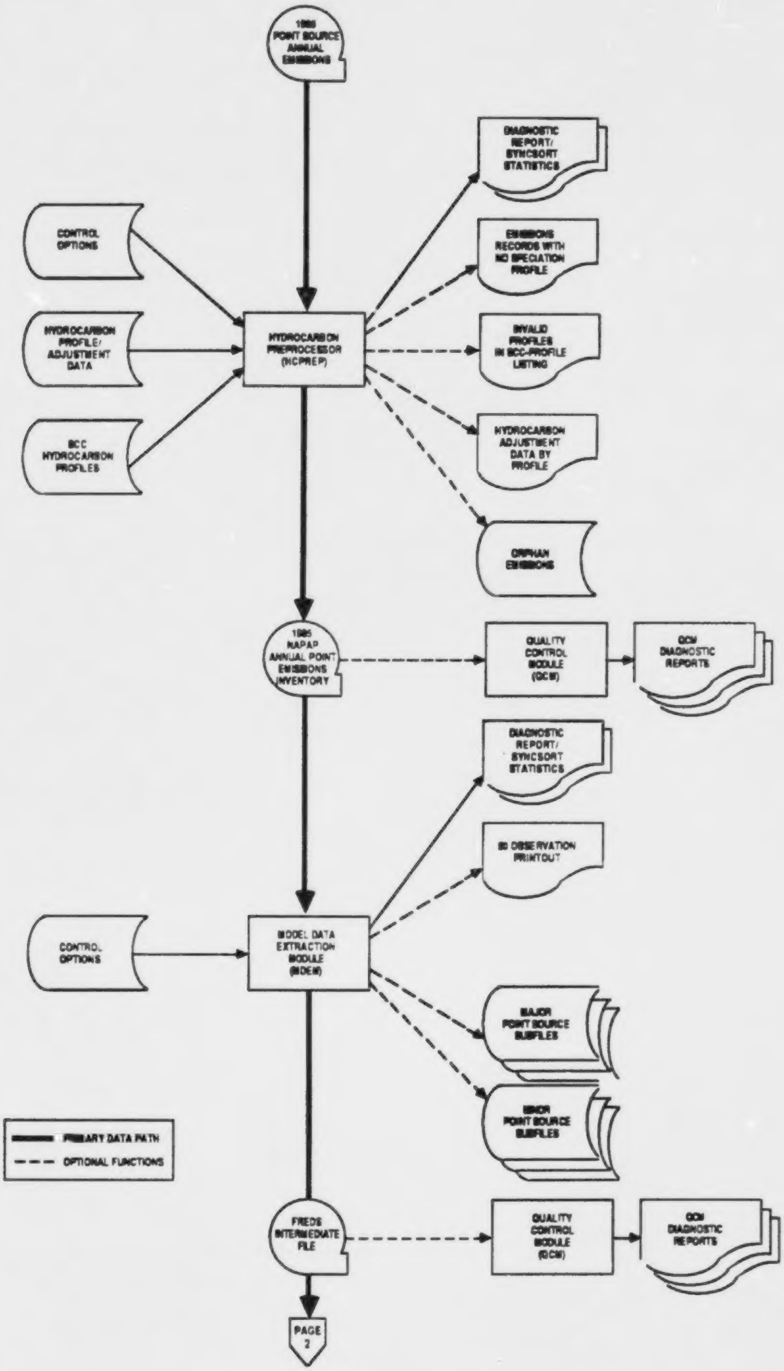
- System Charts
- Detailed Program Description
- Input/Output Format Description
- Control Statements
- Operating Instructions
- Environment
- Example Speciation Module Run and Description.

SECTION 2

SYSTEM CHARTS

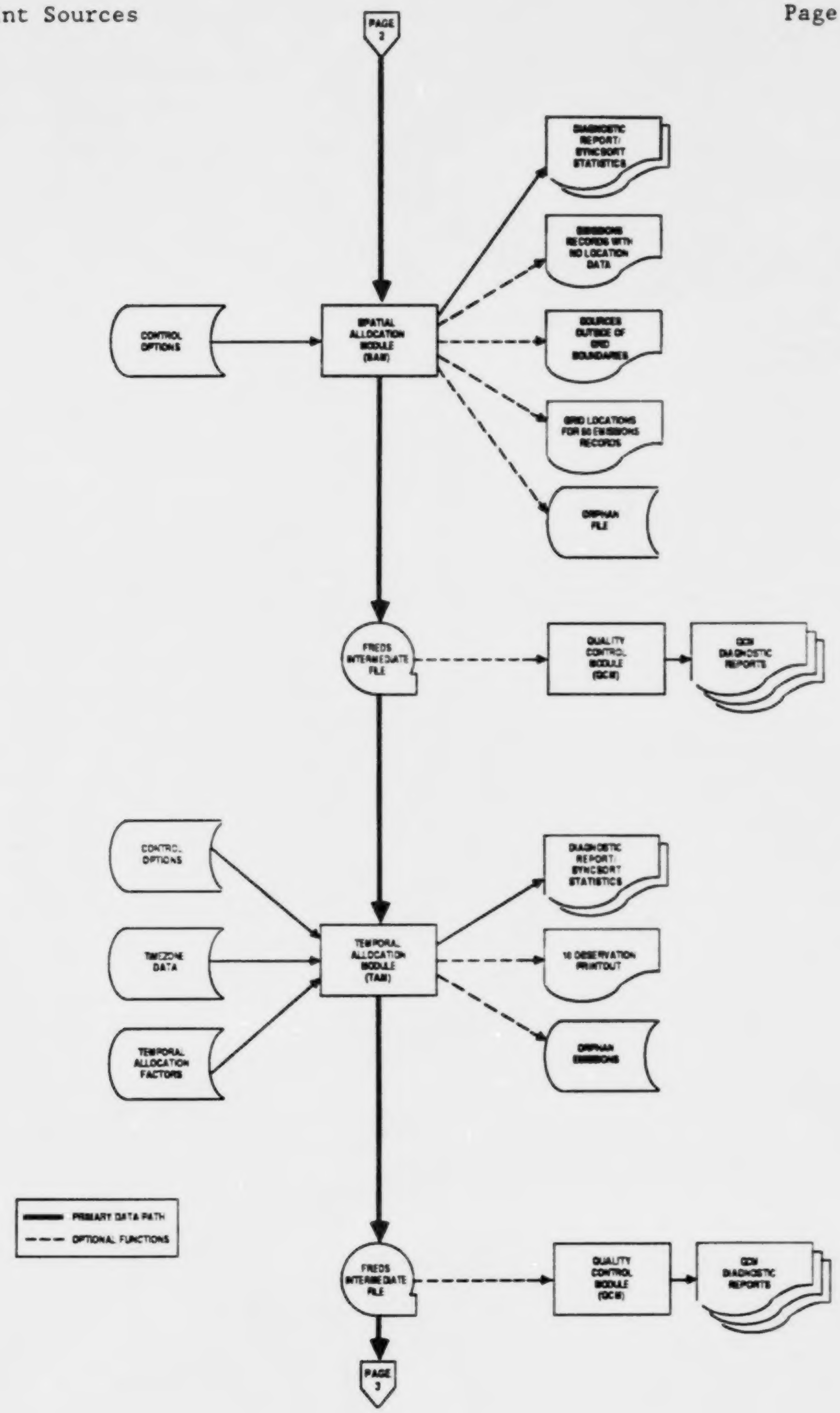
The system flow charts for the Flexible Regional Emissions Data System point and area source processing are presented in this section. The diagrams illustrate the preprocessor module--the Hydrocarbon Preprocessor (HCPREP); the five processing modules--Model Data Extraction Module (MDEM), Temporal Allocation Module (TAM), Speciation Module (SM), Spatial Allocation Module (SAM), and Model Input Preprocessor (MIP); the Quality Control Module (QCM); and corresponding input and output files. The suggested data paths outlined in each diagram minimize file storage and overhead. For both point and area source runs, HCPREP is executed prior to MDEM. For execution of the five processing modules, MDEM must always be first. The order of execution of TAM, SM, and SAM may be interchanged in most cases; however, it is recommended that the user follow the order in the system charts, since interchanging the modules affects the input data and run time. This is especially important for area source processing since SAM and TAM execution have the greatest impacts on file size. For complete FREDS processing, MIP must be executed last for both point and area sources. The Quality Control Module is executed after each of the FREDS processing modules to assure the validity and accuracy of the data through each step. Once MIP is completed, SAS-formatted modeler's tapes are converted to EBCDIC or ASCII format.

FREDS - Point Sources


1985 POINT SOURCE ANNUAL EMISSIONS
CONTROL OPTIONS
HYDROCARBON PROFILE/ ADJUSTMENT DATA
SCC HYDROCARBON PROFILES
HYDROCARBON PREPROCESSOR (HCPREP)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
EMISSIONS RECORDS WITH NO SPECIATION PROFILE
INVALID PROFILES IN SCC-PROFILE LISTING
HYDROCARBON ADJUSTMENT DATA BY PROFILE
ORPHAN EMISSIONS
1985 NAPAP ANNUAL POINT EMISSIONS INVENTORY
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
50 OBSERVATION PRINTOUT
CONTROL OPTIONS
MODEL DATA EXTRACTION MODULE (MDEM)
MAJOR POINT SOURCE SUBFILES
MINOR POINT SOURCE SUBFILES
PRIMARY DATA PATH
OPTIONAL FUNCTIONS
FREDS INTERMEDIATE FILE
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
PAGE 2

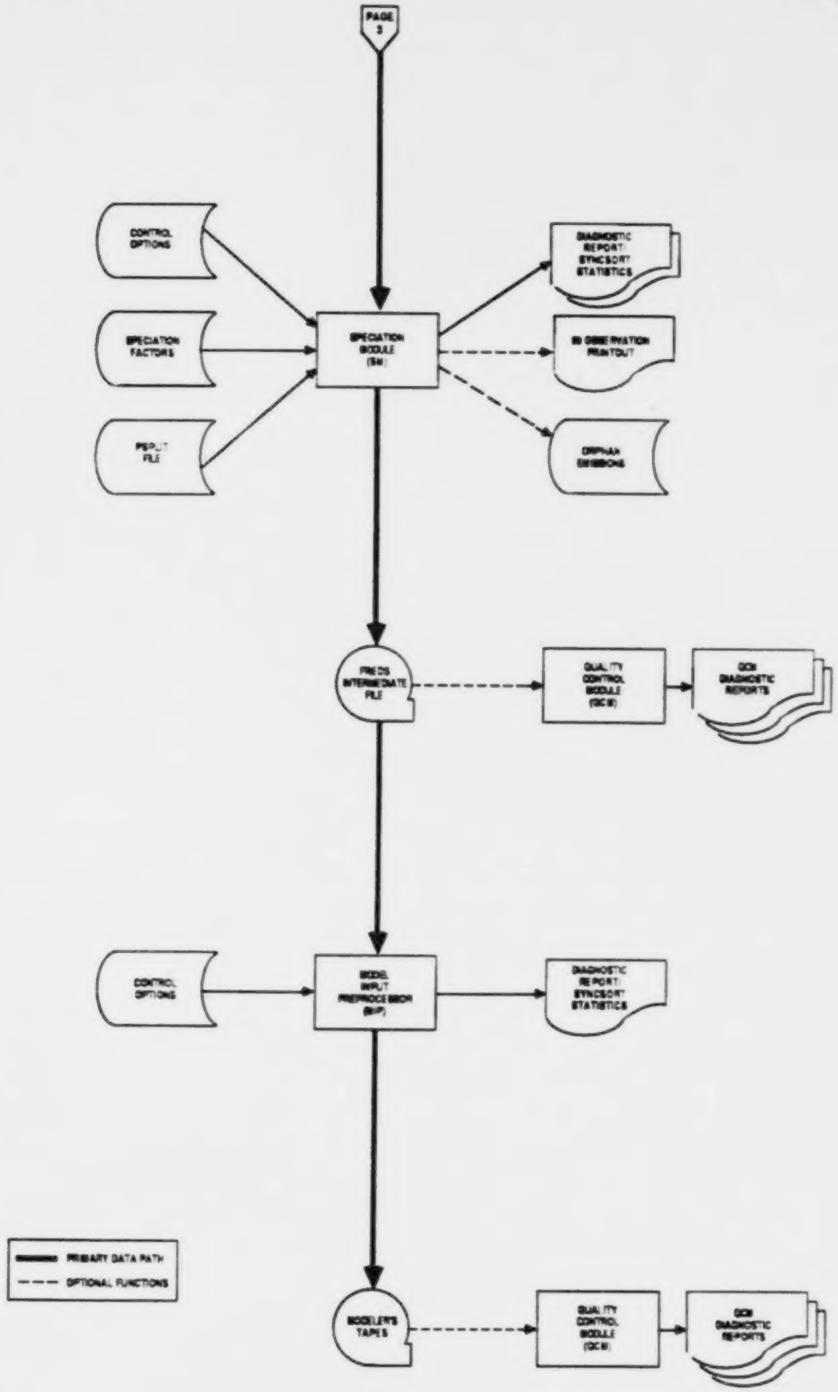
A88 2'2

FREDS - Point Sources


PAGE 2
CONTROL OPTIONS
SPATIAL ALLOCATION MODULE (SAM)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
EMISSIONS RECORDS WITH NO LOCATION DATA
SOURCES OUTSIDE OF GRID BOUNDARIES
GRID LOCATIONS FOR 50 EMISSIONS RECORDS
ORPHAN FILE
FREDS INTERMEDIATE FILE
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
CONTROL OPTIONS
TIMEZONE DATA
TEMPORAL ALLOCATION FACTORS
TEMPORAL ALLOCATION MODULE (TAM)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
10 OBSERVATION PRINTOUT
ORPHAN EMISSIONS
PRIMARY DATA PATH
OPTIONAL FUNCTIONS
FREDS INTERMEDIATE FILE
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
PAGE 3

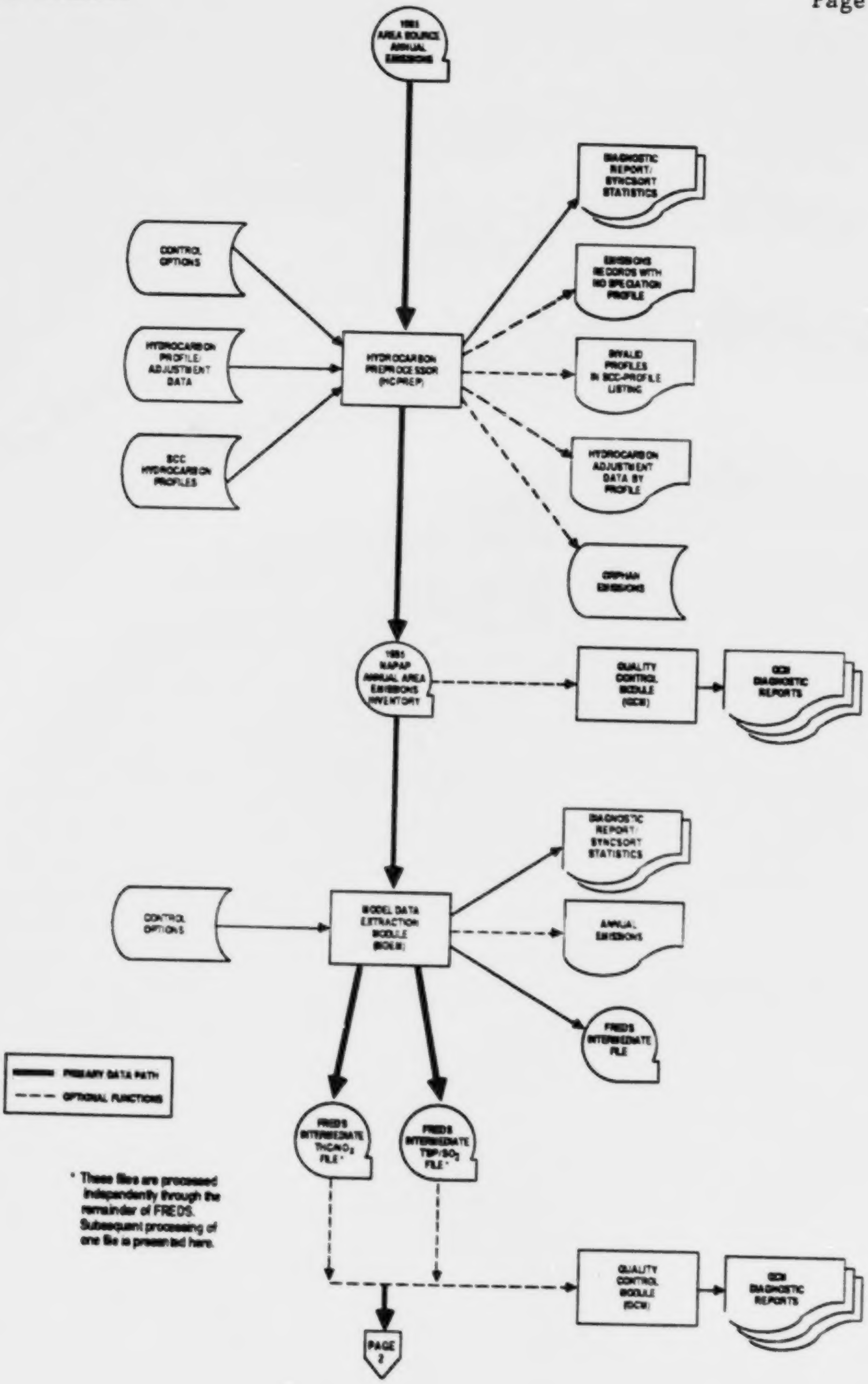
A88 2'2

FREDS - Point Sources


PAGE 3
CONTROL OPTIONS
SPECIATION FACTORS
PSPLIT FILE
SPECIATION MODULE (SM)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
BY OBSERVATION PRINTOUT
ORPHAN EMISSIONS
FREDS INTERMEDIATE FILE
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
CONTROL OPTIONS
MODEL INPUT PREPROCESSOR (MIP)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
PRIMARY DATA PATH
OPTIONAL FUNCTIONS
MODELER'S TAPES
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS

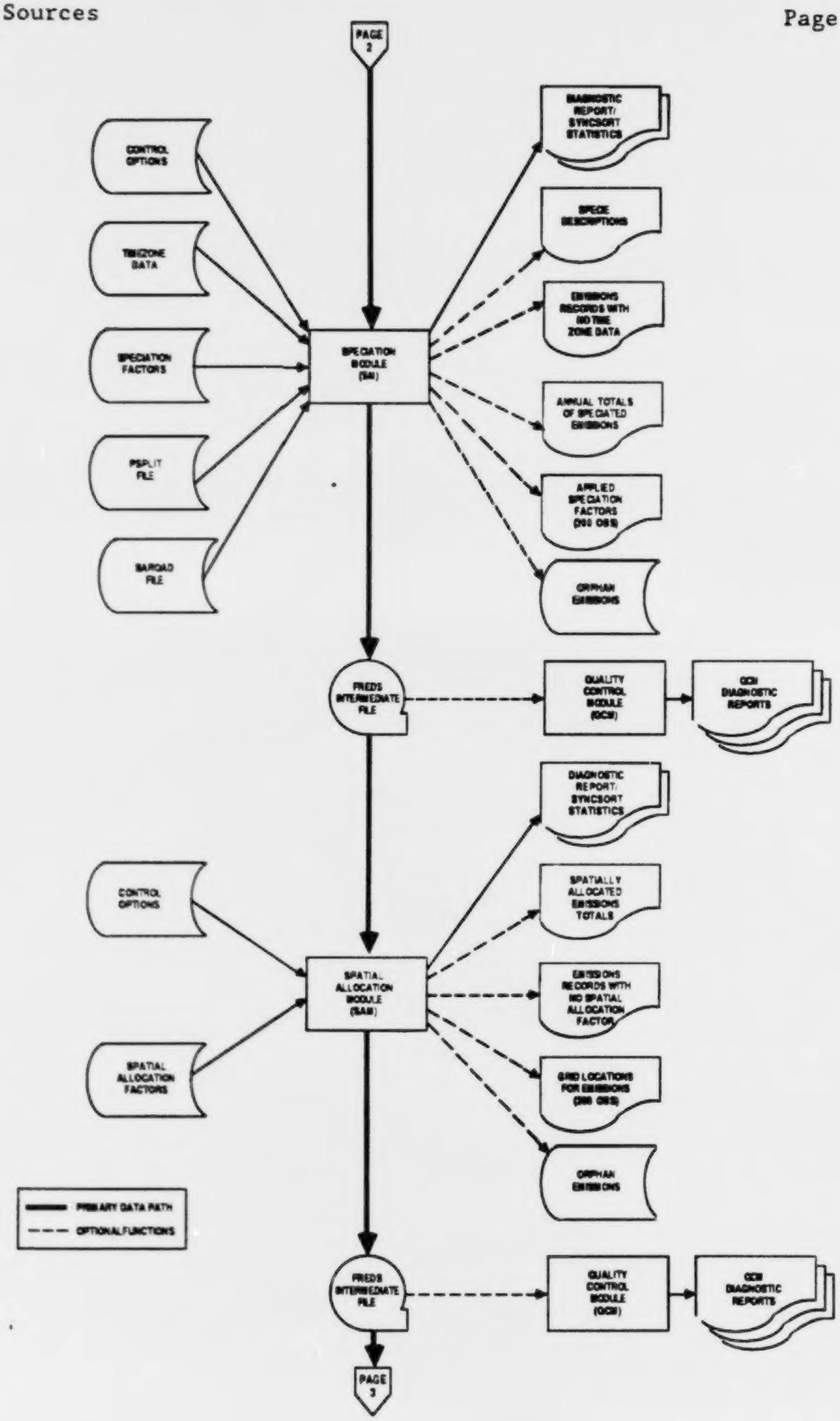
A88 2'2

FREDS--Area Sources


1985 AREA SOURCE ANNUAL EMISSIONS
CONTROL OPTIONS
HYDROCARBON PROFILE/ ADJUSTMENT DATA
SCC HYDROCARBON PROFILES
HYDROCARBON PREPROCESSOR (HCPREP)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
EMISSIONS RECORDS WITH NO SPECIATION PROFILE
INVALID PROFILES IN SCC-PROFILE LISTING
HYDROCARBON ADJUSTMENT DATA BY PROFILE
ORPHAN EMISSIONS
1985 NAPAP ANNUAL AREA EMISSIONS INVENTORY
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
CONTROL OPTIONS
MODEL DATA EXTRACTION MODULE (MDEM)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
ANNUAL EMISSIONS
FREDS INTERMEDIATE FILE
PRIMARY DATA PATH
OPTIONAL FUNCTIONS
FREDS INTERMEDIATE THC/NO$_x$ FILE*
FREDS INTERMEDIATE TSP/SO$_2$ FILE*
* These files are processed independently through the remainder of FREDS. Subsequent processing of one file is presented here.
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
PAGE 2

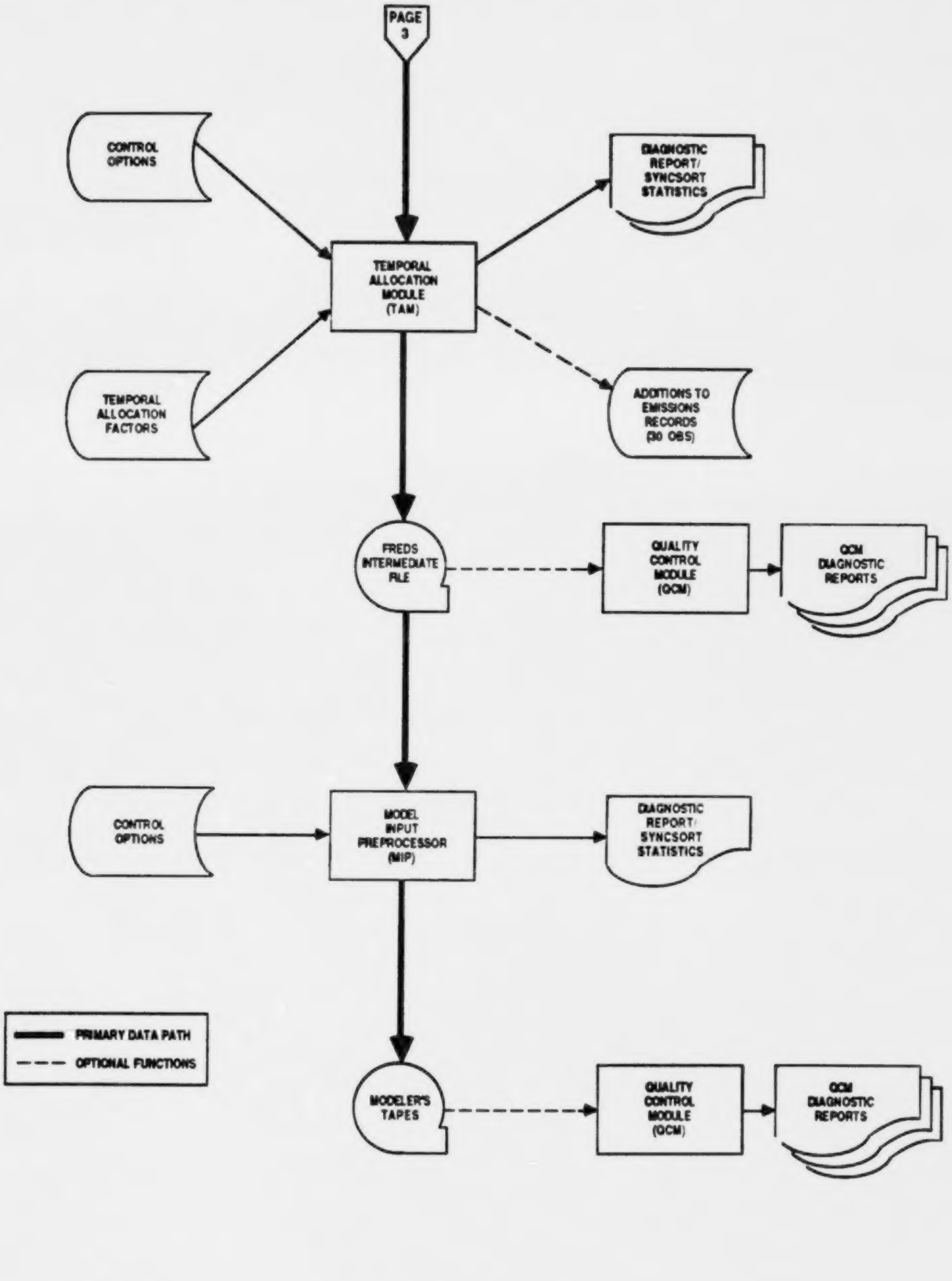
FREDS--Area Sources

Page 2 of 3


PAGE 2
CONTROL OPTIONS
TIMEZONE DATA
SPECIATION FACTORS
PSPLIT FILE
SAROAD FILE
SPECIATION MODULE (SM)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
SPECIE DESCRIPTIONS
EMISSIONS RECORDS WITH NO TIME ZONE DATA
ANNUAL TOTALS OF SPECIATED EMISSIONS
APPLIED SPECIATION FACTORS (200 OBS)
ORPHAN EMISSIONS
FREDS INTERMEDIATE FILE
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
CONTROL OPTIONS
SPATIAL ALLOCATION FACTORS
SPATIAL ALLOCATION MODULE (SAM)
SPATIALLY ALLOCATED EMISSIONS TOTALS
EMISSIONS RECORDS WITH NO SPATIAL ALLOCATION FACTOR
GRID LOCATIONS FOR EMISSIONS (200 OBS)
ORPHAN EMISSIONS
PRIMARY DATA PATH
OPTIONAL FUNCTIONS
FREDS INTERMEDIATE FILE
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
PAGE 3

A88-212

FREDS--Area Sources


PAGE 3
CONTROL OPTIONS
TEMPORAL ALLOCATION MODULE (TAM)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
TEMPORAL ALLOCATION FACTORS
ADDITIONS TO EMISSIONS RECORDS (30 OBS)
FREDS INTERMEDIATE FILE
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS
CONTROL OPTIONS
MODEL INPUT PREPROCESSOR (MIP)
DIAGNOSTIC REPORT/ SYNCSORT STATISTICS
PRIMARY DATA PATH
OPTIONAL FUNCTIONS
MODELER'S TAPES
QUALITY CONTROL MODULE (QCM)
QCM DIAGNOSTIC REPORTS

A88-212

SECTION 3

DETAILED PROGRAM DESCRIPTION

The Flexible Regional Emissions Data System (FREDS) consists of seven independent subsystems used to process point and area source pollutant emissions data for use in regional scale atmospheric simulation modeling. It includes capabilities to format the fully resolved data for input to atmospheric transport models such as the Regional Acid Deposition Model (RADM) and the Regional Oxidant Model (ROM). FREDS software, and associated data files, are installed on the National Computer Center's (NCC) IBM 3090 mainframe computer. The seven modules consist of programs written in the SAS language. The modules are used to preprocess and reformat data, extract modeling and source identification parameters from point source and area source records, resolve annual emissions totals temporally and spatially and apportion emissions totals for composite species (e.g., NO_x, THC, TSP) into individual species and/or size classes. Point and area sources are processed independently utilizing separate source code.

Each of the point and area source modules consists of a series of SAS procedures, data steps, and SAS subroutines called macros. The SAS macro facility allows long and detailed programs to be "packaged" and invoked with a single command. Macros can be defined to accept parameters, retain macro variables across SAS steps and conditionally create SAS statements. The result of processing macro program statements is to produce SAS code which is then passed to the SAS compiler for execution.

A diagnostic report is given at the end of each module, with the level of detail specified by the user. Many "detailed" diagnositc reports contain subsets of the output emissions data file for the module. Limits on the number of observations printed vary from 10 to 200 depending on record length, and are coded into the modules to produce job outputs of reasonable length. This ensures that the "detailed" report option will be a useful diagnostic tool during full-scale FREDS operation.

HYDROCARBON PREPROCESSOR

Hydrocarbons in the NAPAP inventory are expressed as both Volatile Organic Compounds (VOC) and Total Hydrocarbons (THC); emissions for both of these groups are maintained in the inventory. However, inputs to the inventory such as NEDS data generally contain only one value for hydrocarbons. These input values are often calculated on different bases, making quantitative comparisons using raw data prone to inaccuracy. For example, a source reporting "VOC" may or may not include methane in its emission estimation. Also, depending on the method used to estimate emissions, the presence of aldehydes may not be accounted for. Flame ionization detection (FID), for example, is relatively insensitive to aldehydes, hence sources reporting hydrocarbons determined by FID can be assumed to lack a mass corresponding to the expected weight fraction of aldehydes.

To ensure a measure of consistency in hydrocarbon emissions estimations, a module called the Hydrocarbon Preprocessor (HCPREP) was developed for use with the FREDS system. HCPREP can interconvert VOC and THC (deriving either given the other), and adjust emission values to account for missing aldehydes for selected sources. It accepts as input a SAS-formatted annual file containing one hydrocarbon emissions value for each record, and generates a new file containing both THC and VOC.

The decision of whether or not to augment a hydrocarbon emission is based on source category (SCC). The emissions file is merged by SCC with an "adjustment factor file" containing weight fractions of methane and formaldehyde, as well as augmentation flags which specify whether or not to perform augmentation on the source. The flag settings depend on whether or not the source is expected to have accounted for aldehydes and/or methane in its original emissions estimate.

A more detailed description of HCPREP operation is provided in the following section.

Flow Chart and Description

The diagrams illustrating the program flow of HCPREP are provided on the following pages. The same program code can be used with point and area sources; both cases are depicted in the flow charts. The first diagram provides an overview of the operations performed by the module using a series of double-lined processes. Each of these double-lined operations is represented by a second-level flow diagram which details the program logic behind each major process. Each second-level diagram begins with a statement of the operation, and terminates with a return to the first-level diagram.

Like other FREDS modules, HCPREP is designed as an independent, stand-alone program written in the SAS language and makes use of SAS's "macro" programming capabilities. Macros and macro variables are used in HCPREP for the generation of 'detailed' diagnostic reports and the calculation of revised emissions estimates. Values of macro variables (including source type, SAROAD code for input hydrocarbons, and level of report detail) are specified as control options.

In addition to an annual emissions master file, HCPREP requires three other data files as input. They are:

- a Control Options File (COF), which provides identifying information about the emissions file to the program;
- a "weight percent - profile" file, containing, for each speciation profile, the weight percent contributions of formaldehyde and methane as well as two augmentation flags; and
- an "SCC - profile" file, which is used to link the speciation profiles to emission records by source type.

These files can be adjusted to meet the requirements of the input emissions data set. The COF information, for example, is run-specific, providing the input file source type (point or area) and member name as well as a run identification header and the SAROAD code in which the input hydrocarbon value is stored. The SCC - profile file to be used also depends on source type. While the weight percent - profile file is anticipated to remain the same for all FREDS runs for consistency, the settings of the aldehyde and methane flags can be changed, if desired, to accomodate alternative augmentation strategies.

HCPREP begins by reading the Control Options File and checking entries for validity. In particular, valid entries for source type ("PS" for point sources or "AS" for area sources), hydrocarbon SAROAD ("43101" or "43104") and diagnostic report option ("S" for summary, "D" for detailed) are required; invalid specifications for any of these causes immediate program termination.

In order to perform hydrocarbon adjustments, a file must be created which contains adjustment data at the SCC level. This is accomplished by combining the weight percent - profile file (containing adjustment information) with an appropriate SCC - profile file. These files are read, sorted by profile number, and match-merged by profile. The profile number is dropped, and the resultant "SCC - weight percent" intermediate file is re-sorted by SCC.

The emissions master file is read next, sorted and match-merged to the SCC - weight percent file by SCC code. All SCC codes in the inventory should have an SCC match in the weight percent file. Any record which does not have a match indicates either an invalid SCC in the inventory or a missing SCC in the weight percent file. Any such records are removed from the master file and stored in an emissions "orphan" file for special analysis. Following the merge, a diagnostic report is produced listing the control options. If a detailed report is requested in the options, the macro DETAIL is invoked, causing a listing of the identifying information for the orphan emissions records to be printed.

The hydrocarbon augmentation takes place at the end of HCPREP. It is assumed that the annual input emissions file contains one hydrocarbon emission value, stored either as VOC (SAROAD 43104) or THC (43101). The hydrocarbon SAROAD specified in the COF is stored as HC_CODE and converted to the macro variable CODE using the macro function SYMPUT. The emissions array is scanned for each record; when the SAROAD code is equal to the value of HC_CODE, the corrsponding emissions value (EMISS) is extracted and stored as the variable ORIG_HC. This is the original input hydrocarbon value for the emissions record. ORIG_HC is retained in the output emissions data set for possible future reference.

The adjustment factor, ADJ_FAC, is calculated using data from the weight percent - profile file via the formula:

$$\text{ADJ\_FAC} = \frac{(\text{HCHOPCT} * \text{HCHOFLG}) + (\text{CH4PCT} * \text{CH4FLG})}{100} \qquad (1)$$

where

HCHOPCT - weight percent formaldehyde in profile
HCHOFLG - aldehyde augmentation flag (1 - adjust; 0 - do not adjust)
CH4PCT - weight percent methane in profile
CH4FLG - methane augmentation flag (1 - adjust; 0 - do not adjust)

The adjustment factor therefore represents the mass fraction of the species unaccounted for in the value of ORIG_HC, and allows the calculation of two new variables, NEW_THC and NEW_VOC. If ADJ_FAC - 0, all species are accounted for, and NEW_THC - ORIG_HC. Otherwise, NEW_THC is calculated using the equation:

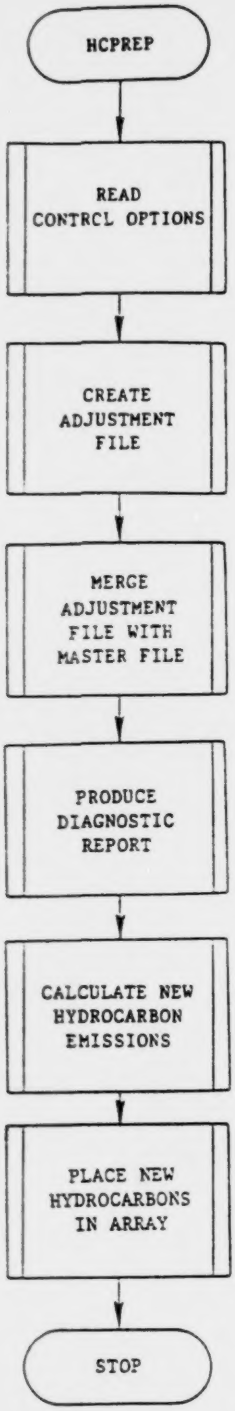
$$\text{NEW\_THC} = \frac{\text{ORIG HC}}{1 - \text{ADJ\_FAC}} \qquad (2)$$

and VOC is derived by removing the weight fraction of methane from THC:

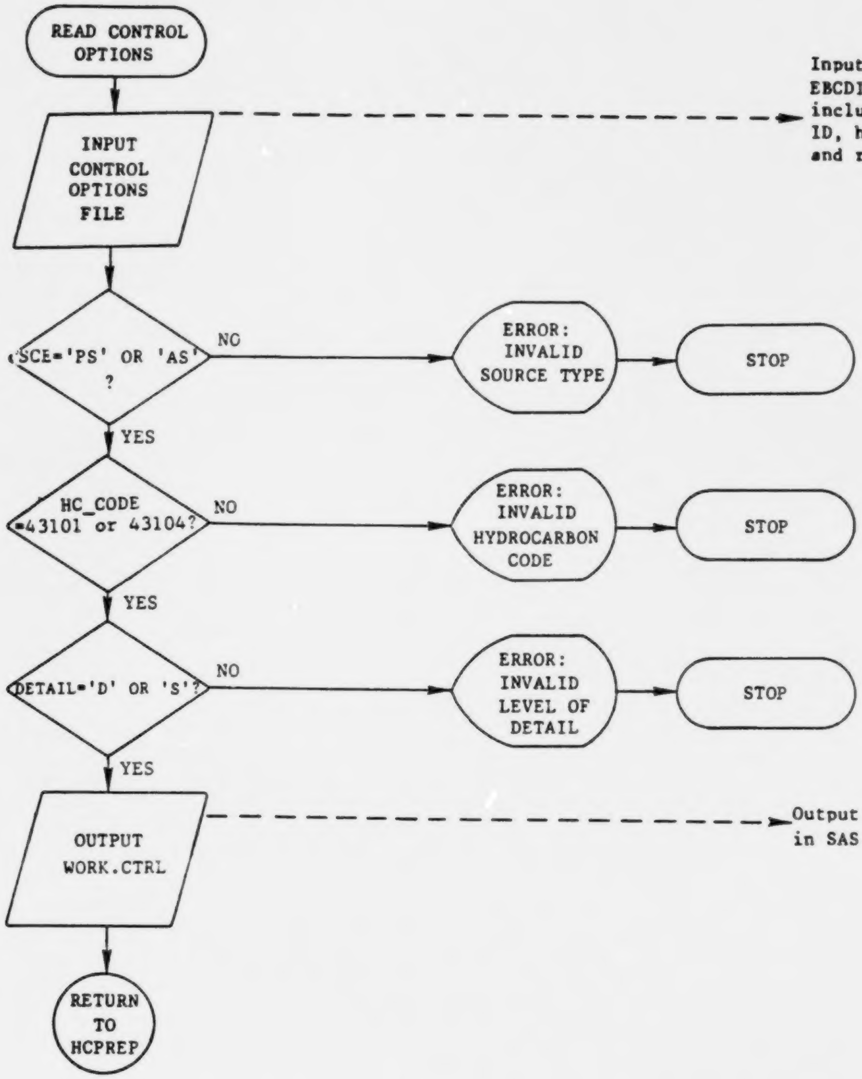
$$\text{NEW\_VOC} = \text{NEW\_THC} * \frac{100 - \text{CH4PCT}}{100} \qquad (3)$$

The final stage of the augmentation process involves placing the new VOC and THC values into the existing emissions array. The input hydrocarbon value occupies one element of the array; this value is replaced by NEW_VOC if CODE is 43104 and by NEW_THC if CODE is 43101. To accomodate the remaining value, the array must be extended by one element. This involves incrementing NUMPOLL, the emission file variable denoting the array size, by 1. The new array index is given values for SAROAD and EMISS corresponding to the remaining hydrocarbon value. That is, if CODE is 43104 (VOC), then THC must be added to the array; the new SAROAD is thus set to 43101 and EMISS is set equal to NEW_THC. If THC was originally supplied, then CODE-43101 and the new array elements will correspond to VOC (SAROAD - 43104, EMISS - NEW_VOC).

Hydrocarbon Preprocessor -- Page 1 of 7


HCPREP
READ CONTRCL OPTIONS
CREATE ADJUSTMENT FILE
MERGE ADJUSTMENT FILE WITH MASTER FILE
PRODUCE DIAGNOSTIC REPORT
CALCULATE NEW HYDROCARBON EMISSIONS
PLACE NEW HYDROCARBONS IN ARRAY
STOP

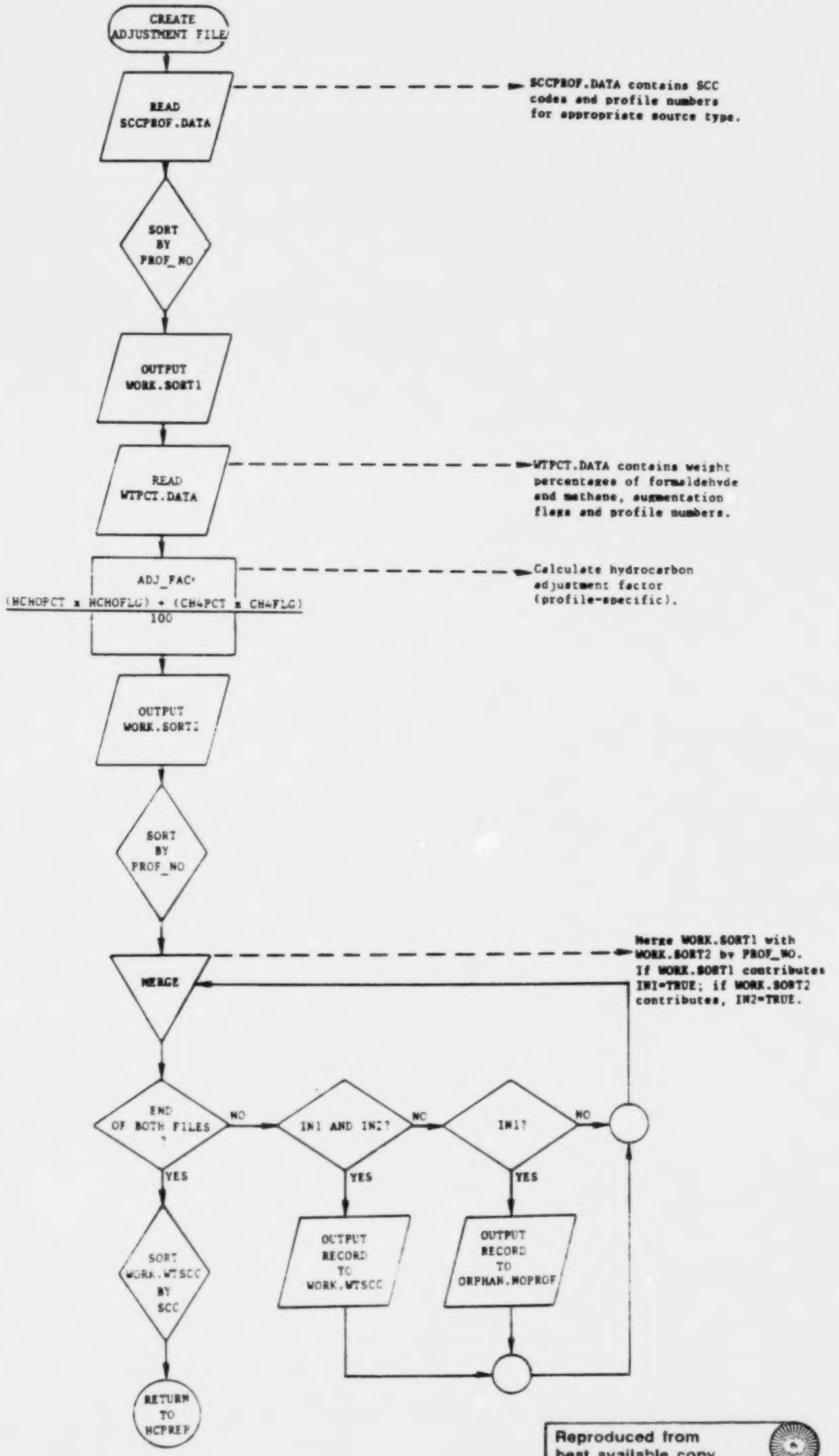
Hydrocarbon Preprocessor --


READ CONTROL OPTIONS
INPUT CONTROL OPTIONS FILE
SCE='PS' OR 'AS' ?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES
HC_CODE =43101 or 43104?
NO
ERROR: INVALID HYDROCARBON CODE
STOP
YES
DETAIL='D' OR 'S'?
NO
ERROR: INVALID LEVEL OF DETAIL
STOP
YES
OUTPUT WORK.CTRL
RETURN TO HCPREP

Input Control Options in EBCDIC format. Options include source type, run ID, hydrocarbon SAROAD, and report detail level.

Output Control Options in SAS format.

Hydrocarbon Preprocessor -- Page 3 of 7


CREATE ADJUSTMENT FILE
READ SCCPROF.DATA
SORT BY PROF_NO
OUTPUT WORK.SORT1
READ WTPCT.DATA
ADJ_FAC= (HCHOPCT x HCHOFLG) + (CH4PCT x CH4FLG) / 100
OUTPUT WORK.SORT2
SORT BY PROF_NO
MERGE
END OF BOTH FILES ?
NO
YES
IN1 AND IN2?
NO
YES
IN1?
NO
YES
SORT WORK.WTSCC BY SCC
RETURN TO HCPREP
OUTPUT RECORD TO WORK.WTSCC
OUTPUT RECORD TO ORPHAN.NOPROF

SCCPROF.DATA contains SCC codes and profile numbers for appropriate source type.

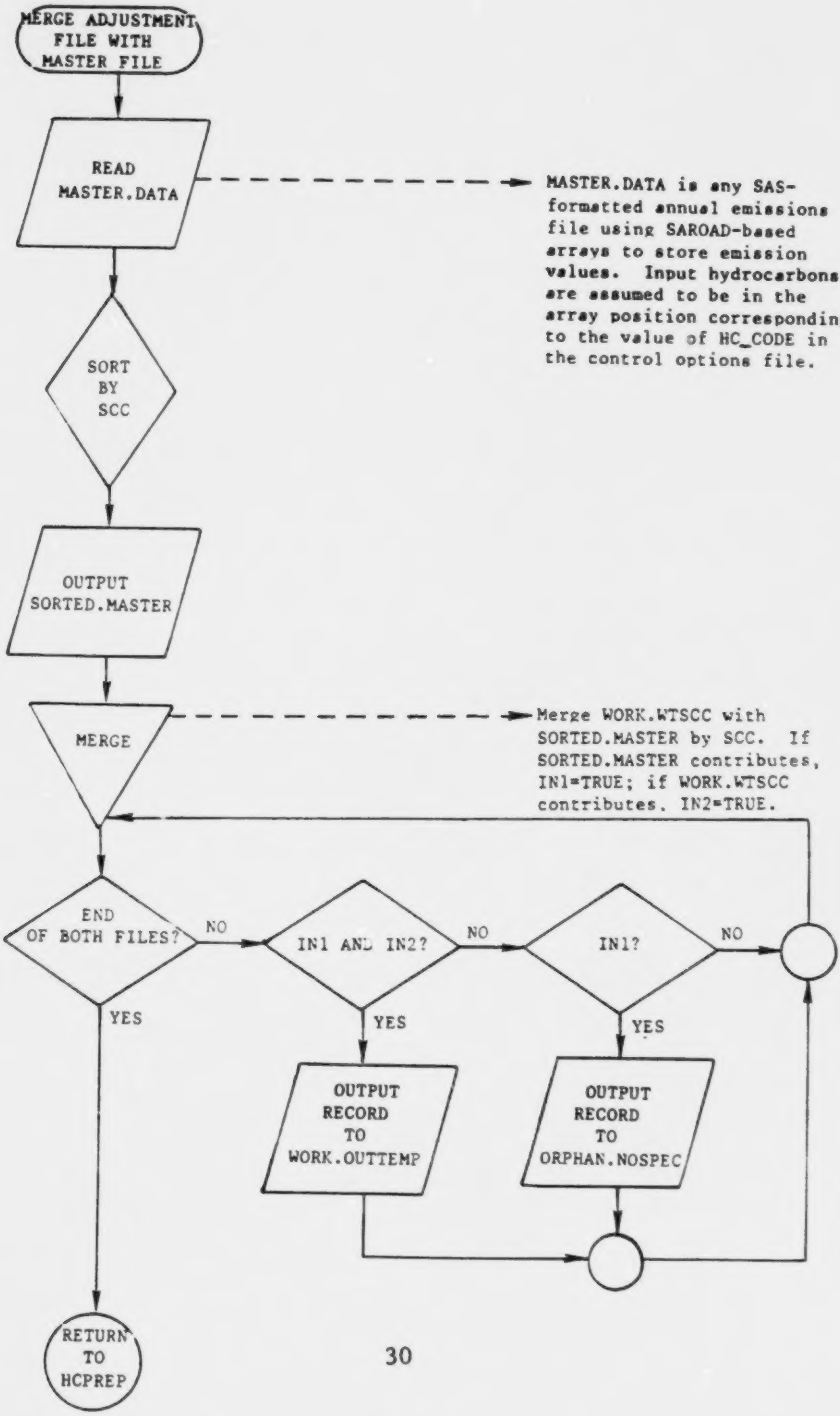
WTPCT.DATA contains weight percentages of formaldehyde and methane, augmentation flags and profile numbers.

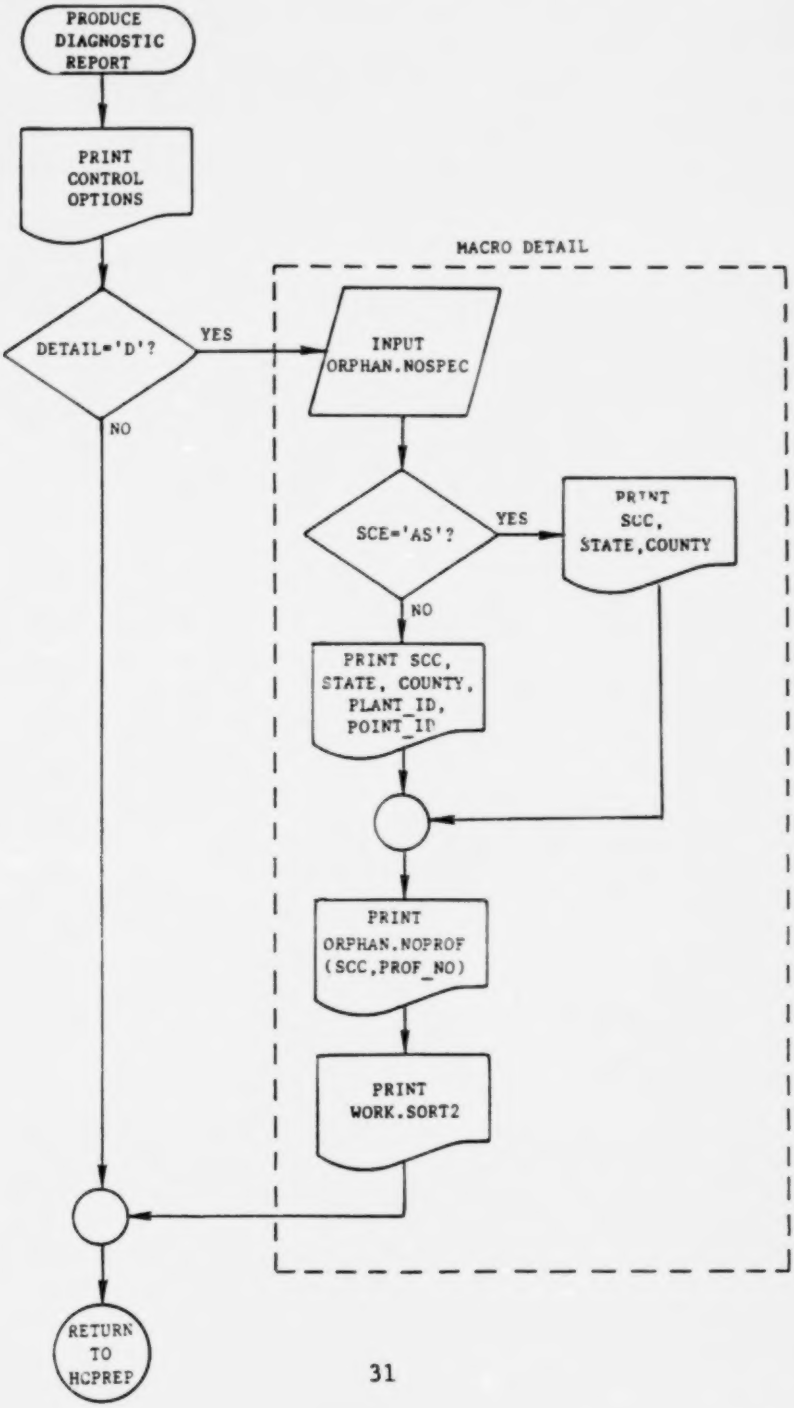
Calculate hydrocarbon adjustment factor (profile-specific).

Merge WORK.SORT1 with WORK.SORT2 by PROF_NO. If WORK.SORT1 contributes IN1=TRUE; if WORK.SORT2 contributes, IN2=TRUE.

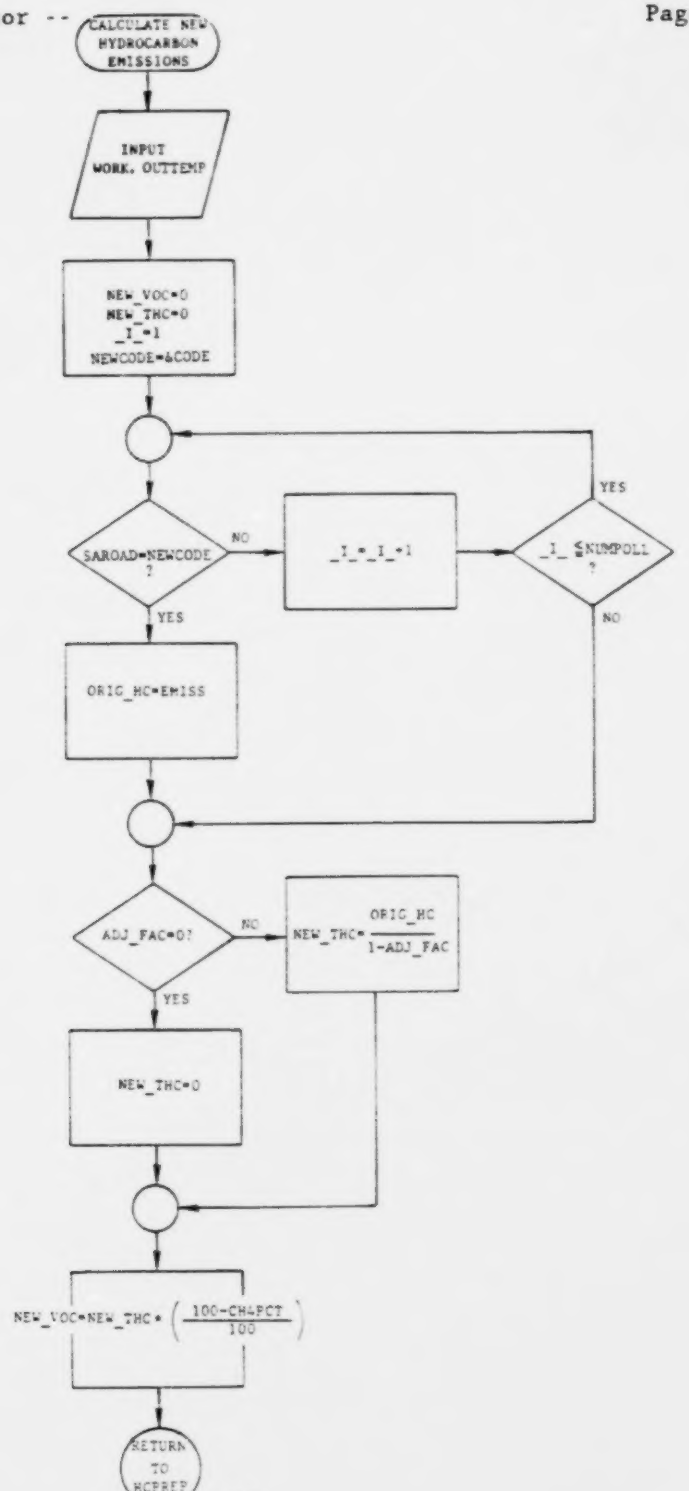
Reproduced from best available copy.

Hydrocarbon Preprocessor --

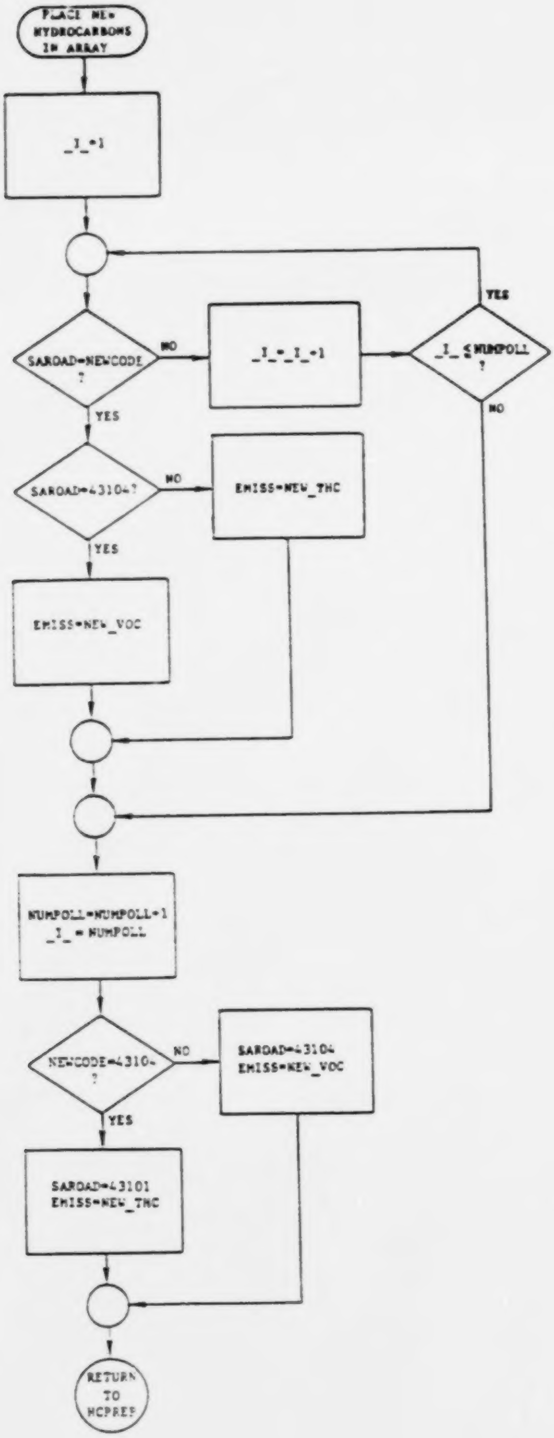

MERGE ADJUSTMENT FILE WITH MASTER FILE
READ MASTER.DATA
MASTER.DATA is any SAS-formatted annual emissions file using SAROAD-based arrays to store emission values. Input hydrocarbons are assumed to be in the array position corresponding to the value of HC_CODE in the control options file.
SORT BY SCC
OUTPUT SORTED.MASTER
MERGE
Merge WORK.WTSCC with SORTED.MASTER by SCC. If SORTED.MASTER contributes, IN1=TRUE; if WORK.WTSCC contributes, IN2=TRUE.
END OF BOTH FILES?
NO
IN1 AND IN2?
NO
IN1?
NO
YES
YES
YES
OUTPUT RECORD TO WORK.OUTTEMP
OUTPUT RECORD TO ORPHAN.NOSPEC
RETURN TO HCPREP


PRODUCE DIAGNOSTIC REPORT
PRINT CONTROL OPTIONS
MACRO DETAIL
DETAIL='D'?
YES
NO
INPUT ORPHAN.NOSPEC
SCE='AS'?
YES
NO
PRINT SCC, STATE, COUNTY
PRINT SCC, STATE, COUNTY, PLANT_ID, POINT_ID
PRINT ORPHAN.NOPROF (SCC,PROF_NO)
PRINT WORK.SORT2
RETURN TO HCPREP

Hydrocarbon Preprocessor --


CALCULATE NEW HYDROCARBON EMISSIONS
INPUT WORK, OUTTEMP
NEW_VOC=0
NEW_THC=0
_I_=1
NEWCODE=&CODE
SAROAD=NEWCODE ?
NO
_I_=_I_+1
_I_ ≤NUMPOLL ?
YES
NO
YES
ORIG_HC=EMISS
ADJ_FAC=0?
NO
NEW_THC= ORIG_HC / 1-ADJ_FAC
YES
NEW_THC=0
NEW_VOC=NEW_THC * (100-CH4PCT / 100)
RETURN TO HCPREP

Hydrocarbon Preprocessor --


PLACE NEW HYDROCARBONS IN ARRAY
_I_=1
SAROAD=NEWCODE ?
NO
YES
_I_=_I_+1
_I_ ≤ NUMPOLL ?
YES
NO
SAROAD=43104?
NO
YES
EMISS=NEW_THC
EMISS=NEW_VOC
NUMPOLL=NUMPOLL+1
_I_ = NUMPOLL
NEWCODE=43104 ?
NO
YES
SAROAD=43104
EMISS=NEW_VOC
SAROAD=43101
EMISS=NEW_THC
RETURN TO HCPREP

QUALITY CONTROL MODULE

One of the critical enhancements performed to FREDS for the 1985 NAPAP Inventory was the incorporation of additional quality assurance/quality control measures. The addition of automated QC checking to each individual module would entail a significant amount of recoding. It was therefore decided to develop a new module capable of accepting and checking an emissions file at any stage of FREDS processing. The resulting Quality Control Module (QCM) is a SAS program which calculates selected emissions sums at each stage of FREDS processing and compares them to corresponding sums calculated at an earlier stage of FREDS processing.

QCM provides an additional level of quality control for FREDS processing, supplementing the checks carried out within the other FREDS modules. The program checks national- and state-level sums for 10 major pollutants, as well as national emissions totals for up to 20 user-selected source categories. This ensures that pollutant data are not unexpectedly altered during the apportioning process. Temporal allocation factors are also checked when present to assure that they sum to unity within a user-specified tolerance. The diagnostic report generated by QCM indicates any discrepancies found, and provides enough information to identify the record(s) in question. The program accepts the following emissions input files for point and area sources from the United States and Canada:

- Emissions files input to FREDS;
- Hydrocarbon Preprocessor (HCPREP) output file;
- Model Data Extraction Module (MDEM) output file;
- Speciation Module (SM) output file;
- Spatial Allocation Module (SAM) output file;
- Temporal Allocation Module (TAM) output file; and
- Model Input Preprocessor (MIP) output file.

The Quality Control Module is a macro-intensive program with the flexibility to execute many different sequences of macro subroutines based on user inputs to the Control Options File. The first record of the Control Options File contains elements which direct execution of the program. The remaining Control Options File records contain tolerances, tolerance factors and source category codes. The main program reads the Control Options File to identify which step of FREDS processing the program is to scrutinize. The appropriate macro subroutine is determined by a concatenation of three key elements. These elements are as follows:

- COUNTRY for emissions data country of origin;
- STEP indicating the step of FREDS processing being checked; and
- SOURCE denoting area or point source.

For example, the United States point source Temporal Allocation Module output file may be checked by entering "USA" for COUNTRY, "TAM" for STEP, and "P" for source. After these three elements are concatenated into the string "USATAMP", the macro subroutine USATAMP will be executed. For cases where the same subroutine is utilized for United States and Canadian sources, the program will substitute the string "ALL" for COUNTRY.

The highest level macro subroutines, such as USATAMP described above, consist of a series of calls for lower level macro subroutines. Most of these lower level subroutines may be classified into three major categories: format routines, summing routines, and report routines. Format subroutines are responsible for subsetting the input file and converting the file structure to the format necessary for the summing routines. Regardless of which stage of FREDS is being processed, all files have identical formats before passing through the appropriate summing routine. Summing routines vary depending on whether the desired output should be a permanent or temporary QC file and on whether the required resolution of the file is to the national, state, or SCC level. Lastly, report routines compile the information assembled and make comparisons to generate a diagnostic report for temporal allocation factors or national, state, or SCC-level emissions.

Additional items which may be specified by the user in the Control Options File include tolerance factors for each pollutant, individual tolerances for seasonal, daily, and hourly temporal allocation factors, 20 source category codes for verification of national totals, the maximum number of error messages to be printed in diagnostic reports, and a flag indicating whether comparisons are to be made to emissions input to FREDS or emissions output from a FREDS module.

Pollutant tolerances are calculated relative to the magnitude of the corresponding QC emissions input to the module. For example, a tolerance factor of 1×10^{-6} specified for SO_2 indicates that the difference between the QC total of SO_2 and the newly calculated total of SO_2 should not be greater than 1×10^{-6} times the QC total of SO_2. Tolerances specified for temporal allocation factors define how much an allocation factor sum may vary from unity.

The following are program descriptions for each of the high level macro subroutines which may be executed by specifying combinations of COUNTRY, STEP, and SOURCE in the Control Options File.

STEP - "ONE"

The original baseline emissions sums which may be used to check emissions from subsequent steps in FREDS processing are created by specifying a value of "ONE" for the variable STEP in the Control Options File, along with the appropriate country and source. The input file specified in JCL statements is read, subset for necessary variables only, and manipulated into a format to be used in subsequent emissions summing routines. This file is then processed through three summing routines to produce three output files containing totals for the nation, applicable states or provinces, and SCCs.

STEP - "HCP" , STEP - "MDM" , and STEP - "SPM"

For quality control processing of the Hydrocarbon Preprocessor output, the string "HCP" is entered for STEP in the Control Options File. The input file is subset and transformed into a format suitable for summing routines. For area sources, pollutants must be renamed, while for point sources, pollutant names must be assigned by matching the emissions in the EMISS array with the pollutant specific SAROAD code in the SAROAD array. Three temporary SAS files are created by summing the pollutants to create national, state, and SCC totals. The SCC totals file contains totals only for those SCCs specified in the Control Options File.

These totals are then merged with the QC totals to verify that they do not vary from the original sums by more than the tolerance specified in the Control Options File. National totals are merged one-to-one, state totals are merged by state, and SCC totals are merged by SCC. Emissions falling outside the criteria for the given pollutant will cause generation of an error message which is output to a report file. A separate diagnostic report file is output for national, state, and SCC totals.

The process is essentially the same for step "MDM" and step "SPM" except that when split area source files are processed, the NO_x/THC file and the SO_2/TSP file must be merged into a single data set before processing proceeds through QCM.

STEP - "SAM"

Since FREDS point and area source emissions files differ from each other in structure, most QCM processing steps contain separate macro subroutines for area and point sources. For the Spatial Allocation Module (SAM), the number of area source output files may vary with the country being processed. This necessitated the development of a single macro to process any point source SAM file, but separate macros for processing Canadian or U.S. area source SAM data.

The point source routine sums pollutants, performs quality assurance checks, and outputs diagnostic reports as in the point source routines for other steps. The number of area source SAM output files depends upon the size of the annual file input to FREDS. Area source routines must merge pairs of the split NO_x/THC and SO_x/TSP files into single data files before processing. The formatting and summing steps are performed individually on these merged files, storing each file's sum in a temporary data set. The temporary files are then concatenated into one data file and summed prior to comparison with previous emissions and generation of diagnostic reports.

STEP - "TAM"

Processing for quality assurance of the Temporal Allocation Module (TAM) output is similar to that of SAM. This step, however, involves 12 area source output files from TAM for each area source SAM output file.

Area source TAM output files are temporally resolved and contain no temporal factors. For point sources, a quality control check is performed on seasonal, daily, and hourly temporal allocation factors. Seasonal factors for weekday, Saturday, and Sunday are summed and examined to ensure that they do not differ from unity by more than the specified control options tolerance. Totals for hourly factors and weighted totals for daily factors are also calculated and checked in the same manner for 12 different temporal scenarios. Diagnostic reports for state and SCC totals are not generated for area source TAM QCM runs since state and SCC variables are dropped during area source TAM processing. A typical set of area source TAM runs results in 48 output files.

STEP - "MIP"

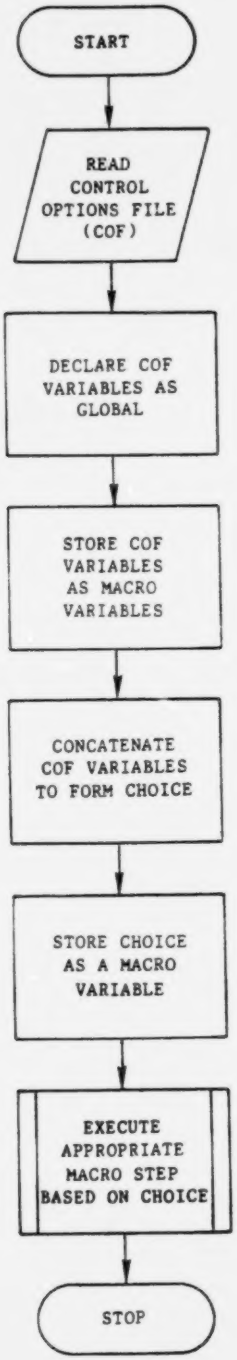
As the FREDS Model Input Preprocessor (MIP) is executed, United States and Canadian data files are combined for both point and area sources. The point source files at the MIP stage contain emissions merged with the appropriate species and temporal factors, while the area source file contains resolved emissions. For QCM execution on the MIP output files, the string "ALL" should be entered for COUNTRY in the control options file, along with the string "MIP" for STEP, and the appropriate "A" or "P" denoting SOURCE.

Point source MIP output resides in one file from which national, state, and SCC totals are calculated and the three associated diagnostic reports are generated. Area source MIP data are output into 12 files, each containing data for one temporal scenario. The emissions data in these files must be multiplied by appropriate weighting factors before being merged into a single file for QCM processing. The area source files also do not contain State or SCC variables. As a result, only the national totals diagnostic report is generated for area source MIP output.

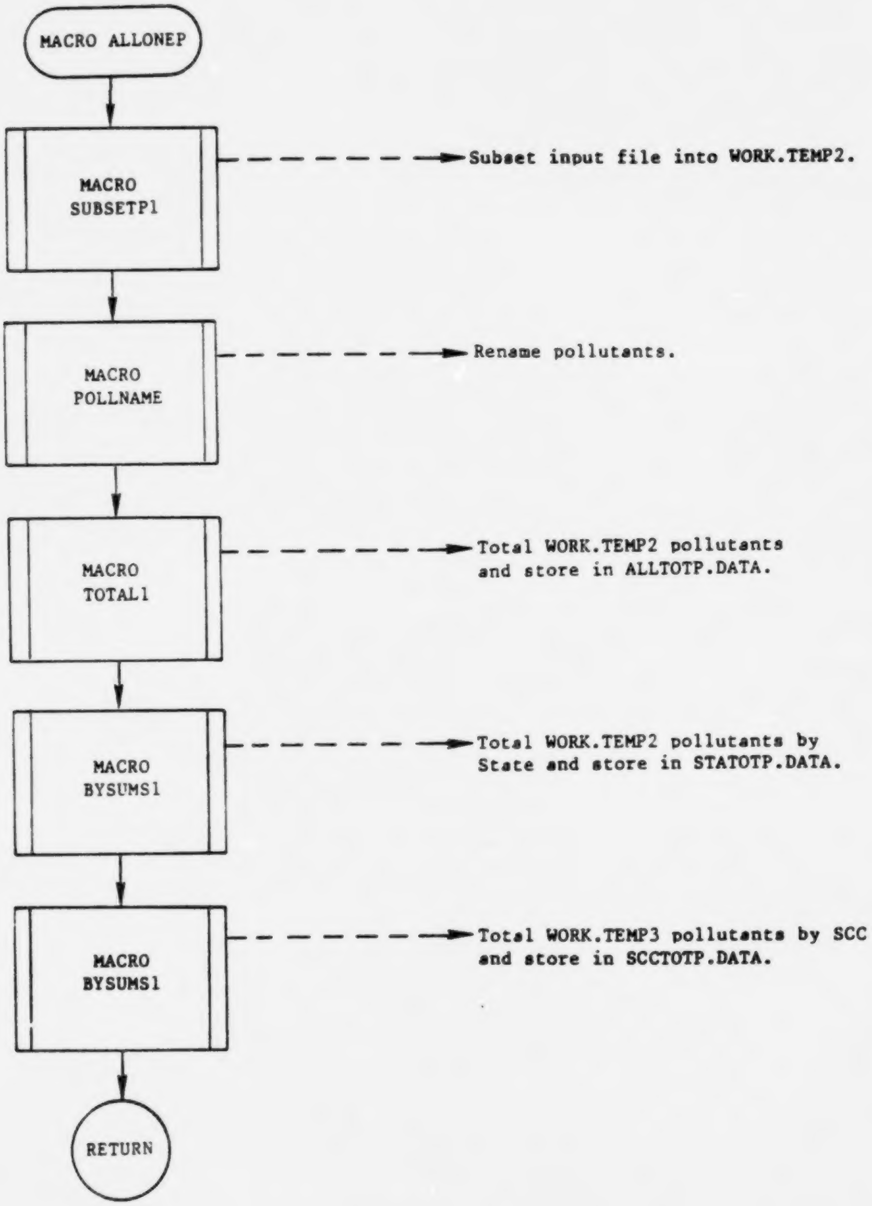
STEP - "SMA" AND STEP - "SMR"

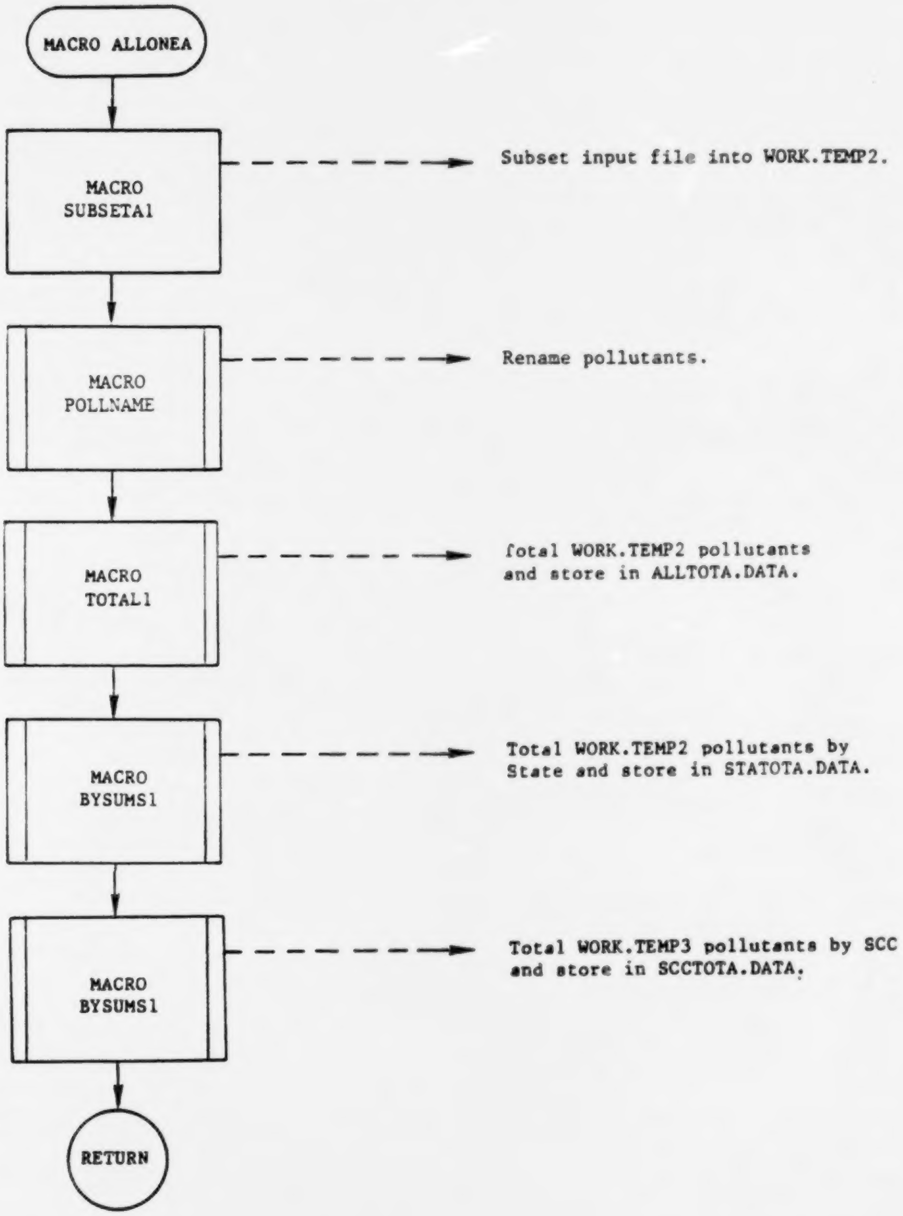
Estimates of emissions from annual and resolved data files are required at various levels of aggregation for analytical purposes. Normally, emissions totals are generated at the SCC, state or region level for point and area sources using a series of independent programs. However, many of the summing routines incorporated in these programs appear as lower level macros in QCM. To provide a single source for obtaining these summed files, four additional high level macros were incorporated into QCM, called ALLSMAP, ALLSMAA, ALLSMRP, and ALLSMRA. These macros are specified by the user in the control options by indicating annual or resolved sums ("SMA" or "SMR") for the variable STEP and the appropriate source type ("P" or "A") for the variable SOURCE. Each of the macros generates a partitioned SAS data set containing emissions totals at the national, state, regional, and SCC level.

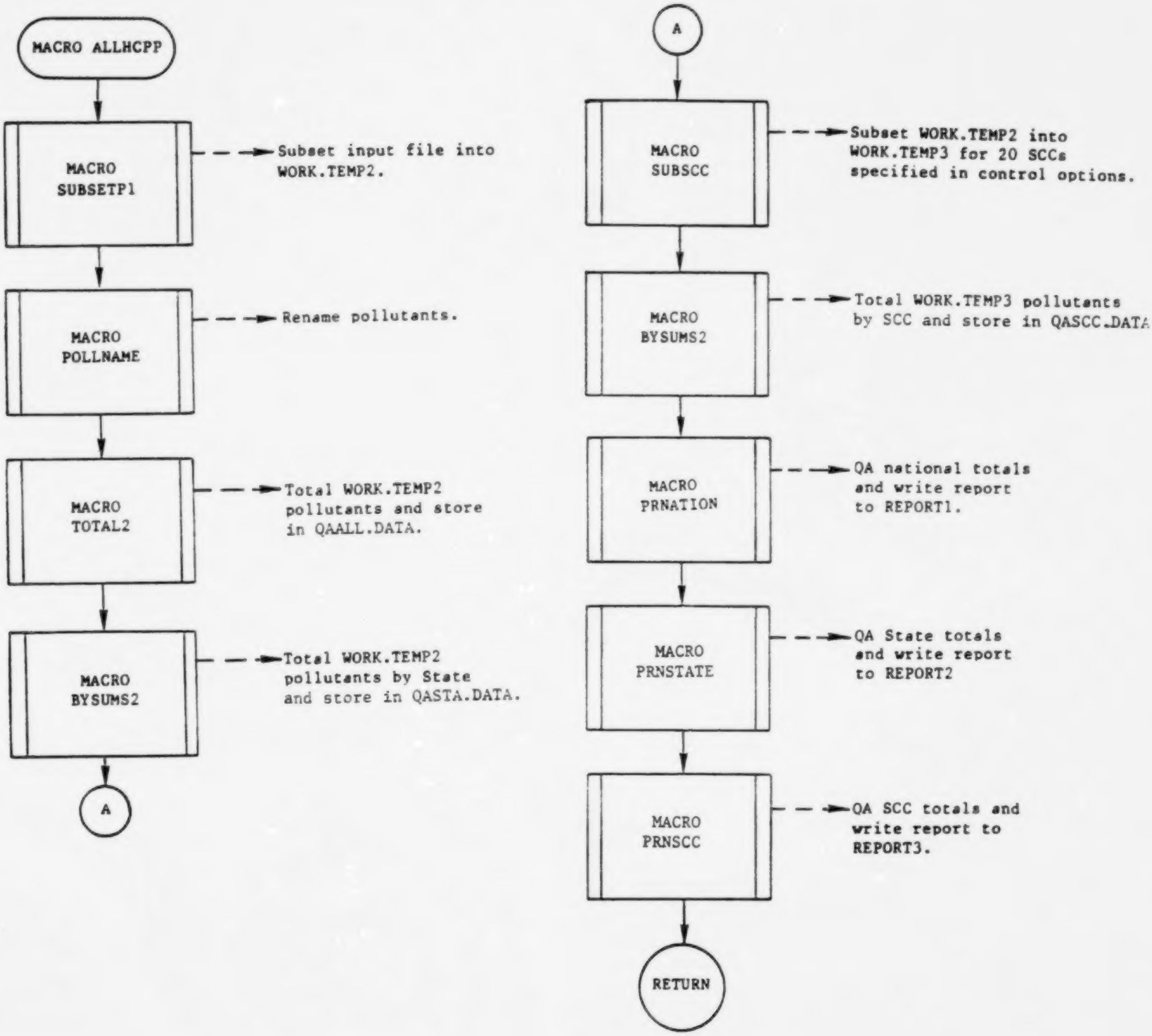
The four macros which generate summed files operate in the same fashion as other high level QCM macros, by calling subroutines to subject input data and calculate emissions sums at various levels of aggregation. No diagnostic reports are generated for these macros, however. Annual emissions are obtained from HCPREP output files, and resolved sums are generated using Speciatio Module output. Emissions by EPA Region are obtained by merging the state-level sums with a file that matches NEDS state codes with the corresponding EPA Region. Resolved point source data are obtained by multiplying speciation factors with the appropriate major pollutant; hydrocarbon species emissions are expressed in moles, while other emissions data are expressed in tons.

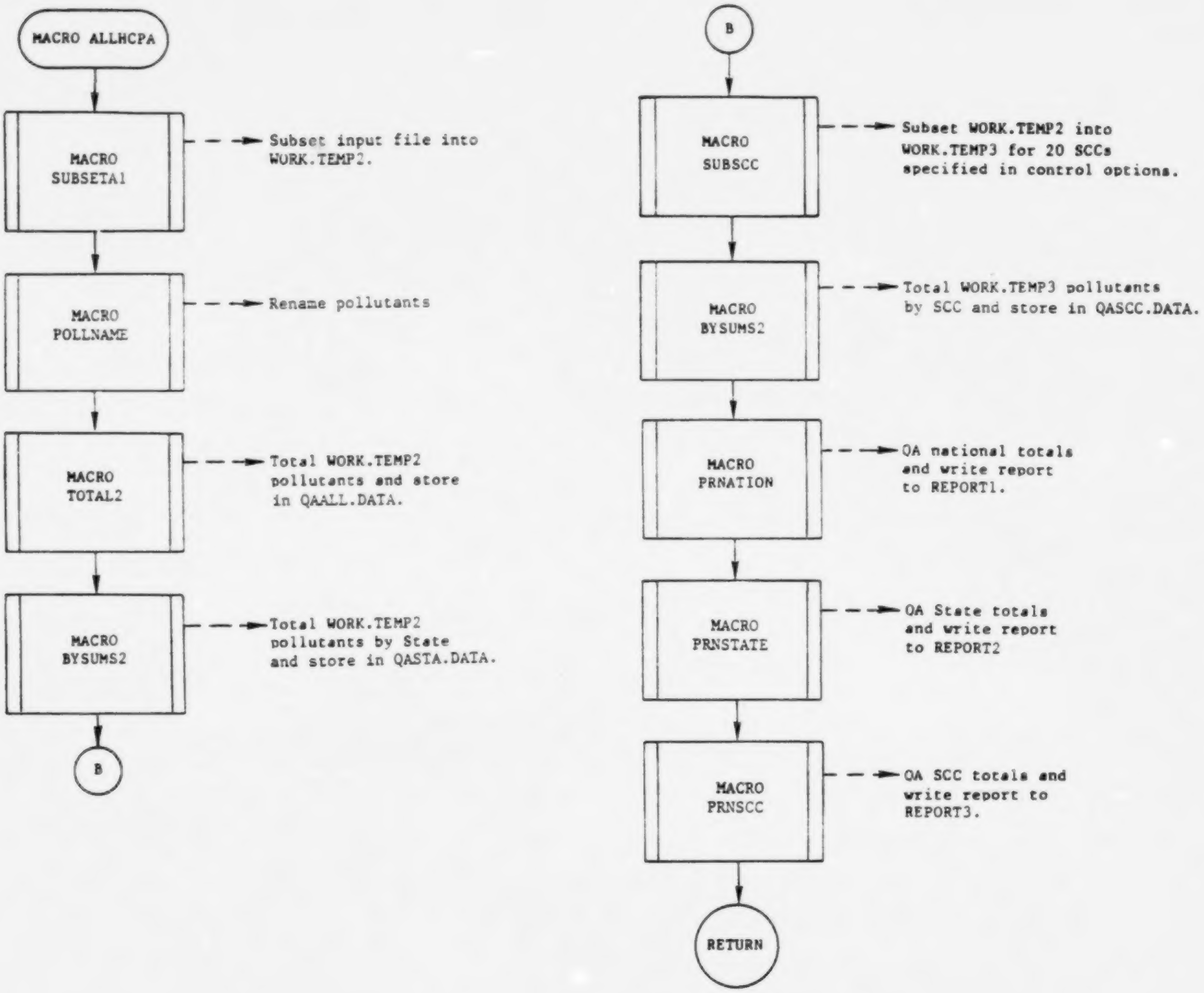

START
READ CONTROL OPTIONS FILE (COF)
DECLARE COF VARIABLES AS GLOBAL
STORE COF VARIABLES AS MACRO VARIABLES
CONCATENATE COF VARIABLES TO FORM CHOICE
STORE CHOICE AS A MACRO VARIABLE
EXECUTE APPROPRIATE MACRO STEP BASED ON CHOICE
STOP

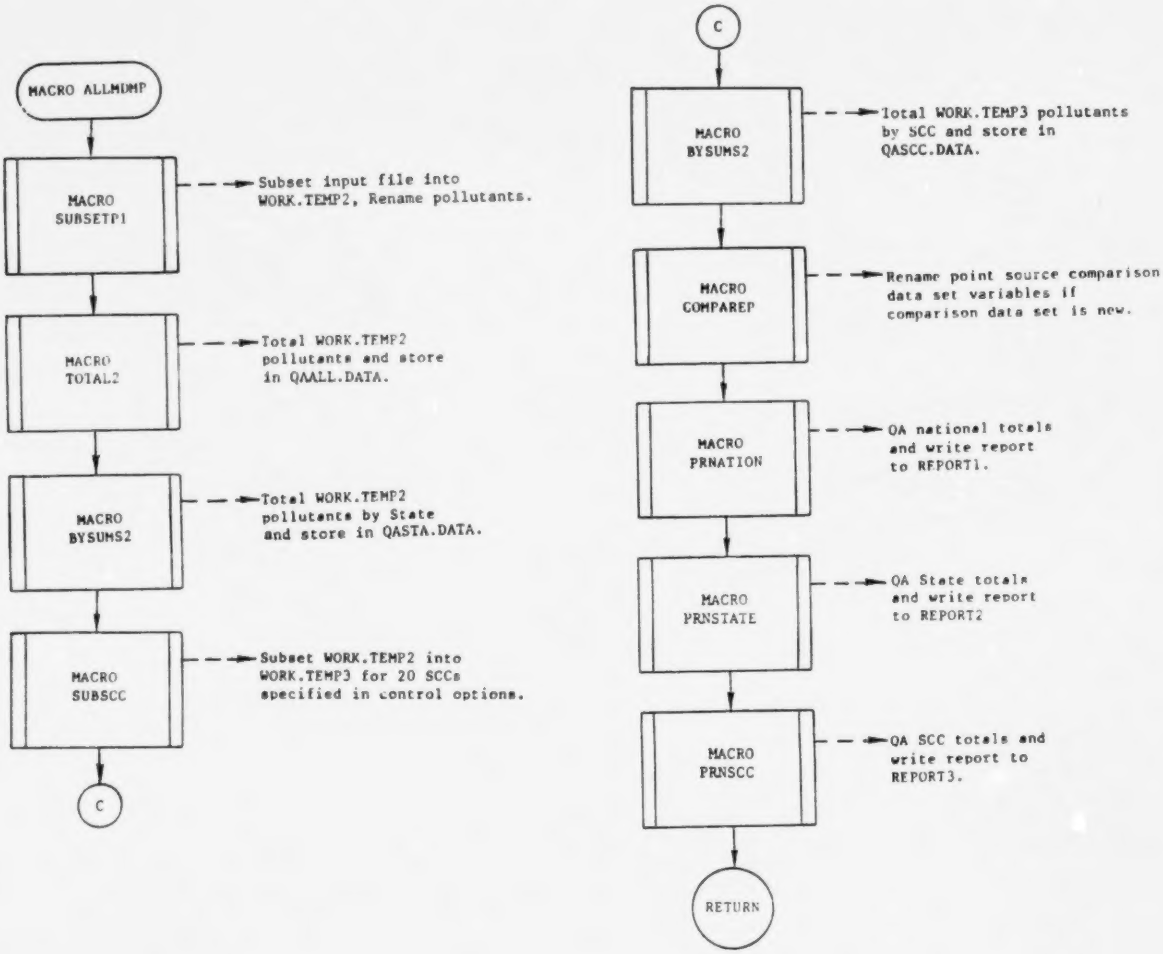
Quality Control Module --

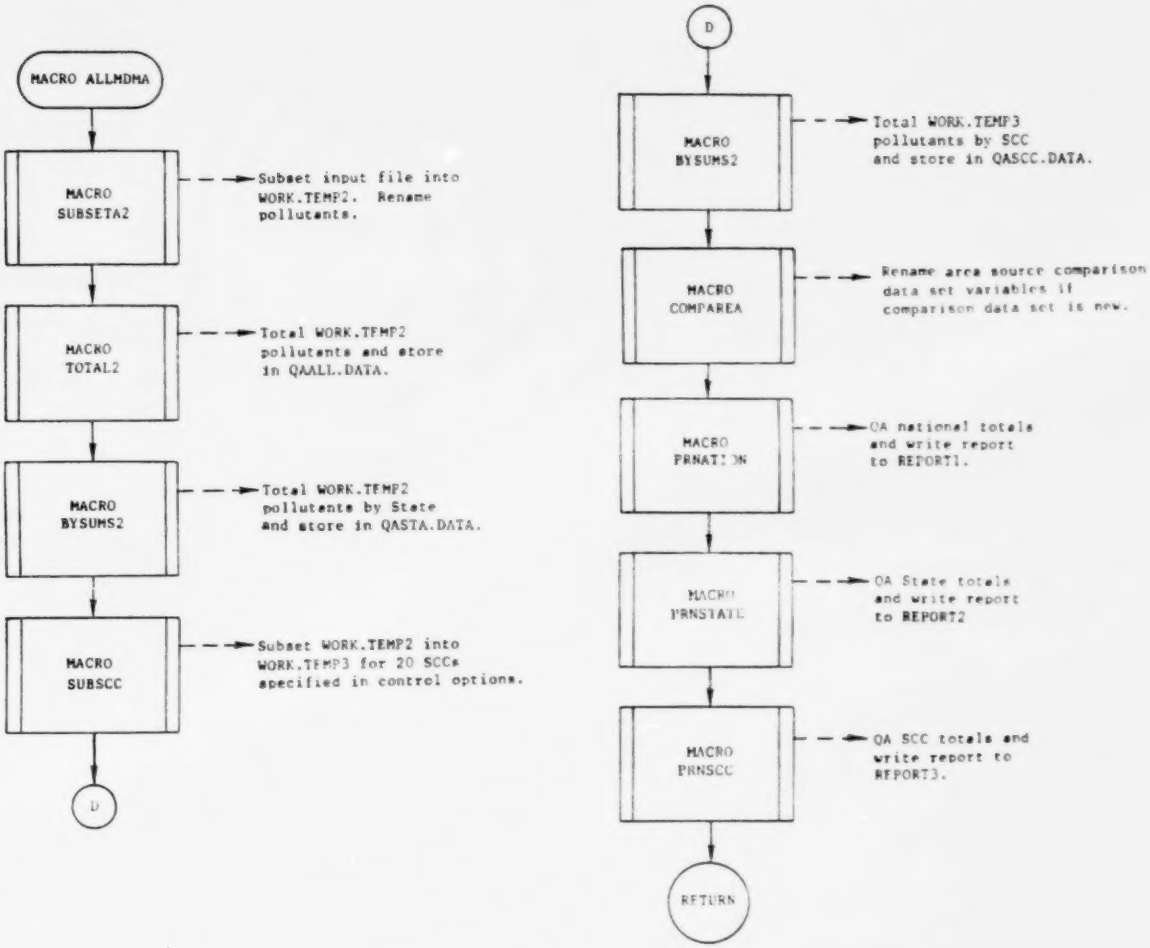

MACRO ALLONEP
MACRO SUBSETP1
Subset input file into WORK.TEMP2.
MACRO POLLNAME
Rename pollutants.
MACRO TOTAL1
Total WORK.TEMP2 pollutants and store in ALLTOTP.DATA.
MACRO BYSUMS1
Total WORK.TEMP2 pollutants by State and store in STATOTP.DATA.
MACRO BYSUMS1
Total WORK.TEMP3 pollutants by SCC and store in SCCTOTP.DATA.
RETURN

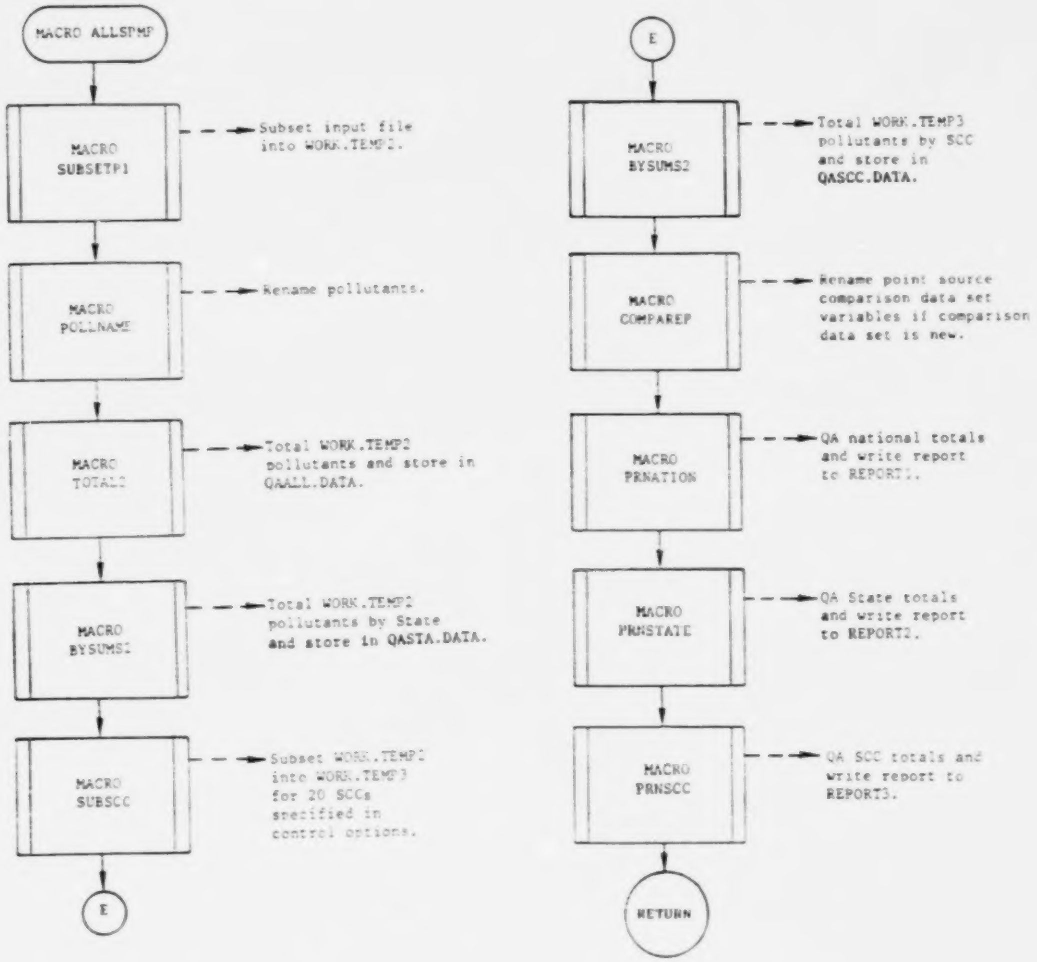

MACRO ALLONEA
MACRO SUBSETA1
Subset input file into WORK.TEMP2.
MACRO POLLNAME
Rename pollutants.
MACRO TOTAL1
Total WORK.TEMP2 pollutants and store in ALLTOTA.DATA.
MACRO BYSUMS1
Total WORK.TEMP2 pollutants by State and store in STATOTA.DATA.
MACRO BYSUMS1
Total WORK.TEMP3 pollutants by SCC and store in SCCTOTA.DATA.
RETURN

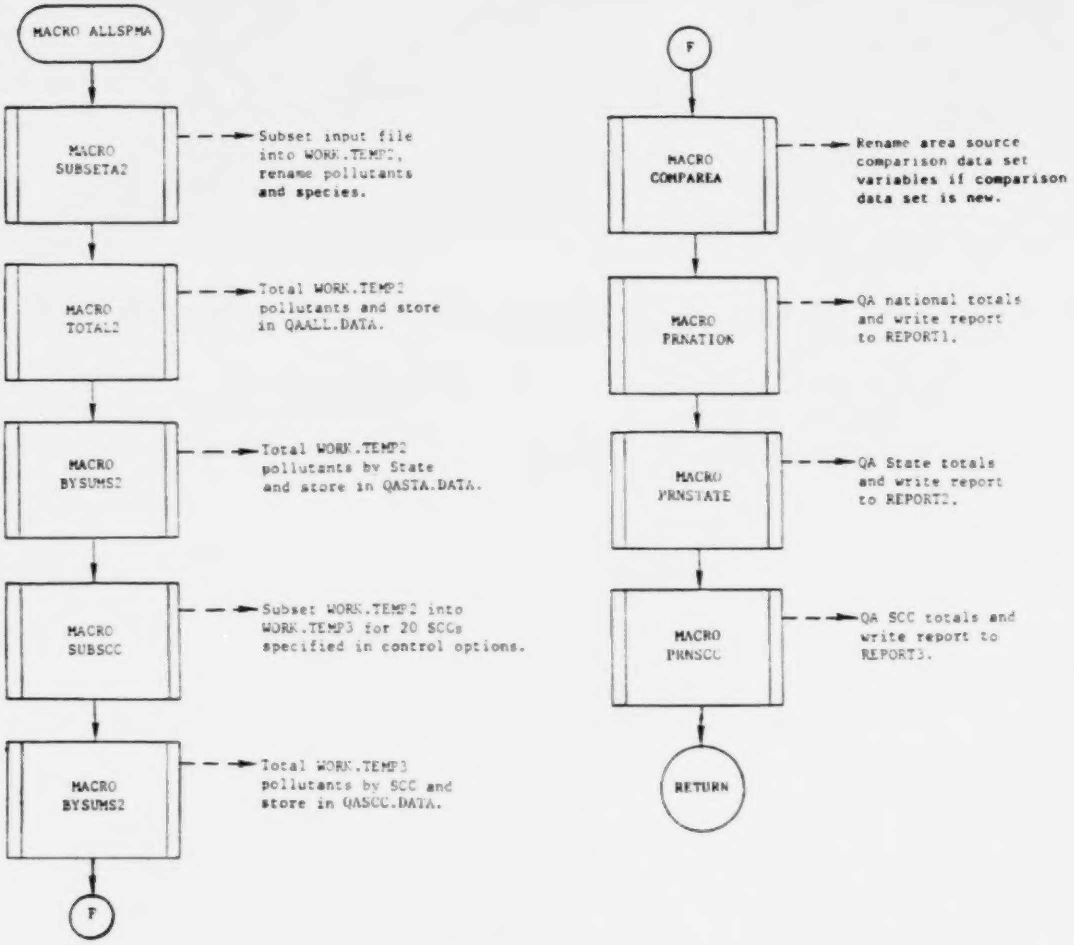

MACRO ALLHCPP
MACRO SUBSETP1
Subset input file into WORK.TEMP2.
MACRO POLLNAME
Rename pollutants.
MACRO TOTAL2
Total WORK.TEMP2 pollutants and store in QAALL.DATA.
MACRO BYSUMS2
Total WORK.TEMP2 pollutants by State and store in QASTA.DATA.
A
A
MACRO SUBSCC
Subset WORK.TEMP2 into WORK.TEMP3 for 20 SCCs specified in control options.
MACRO BYSUMS2
Total WORK.TEMP3 pollutants by SCC and store in QASCC.DATA
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN

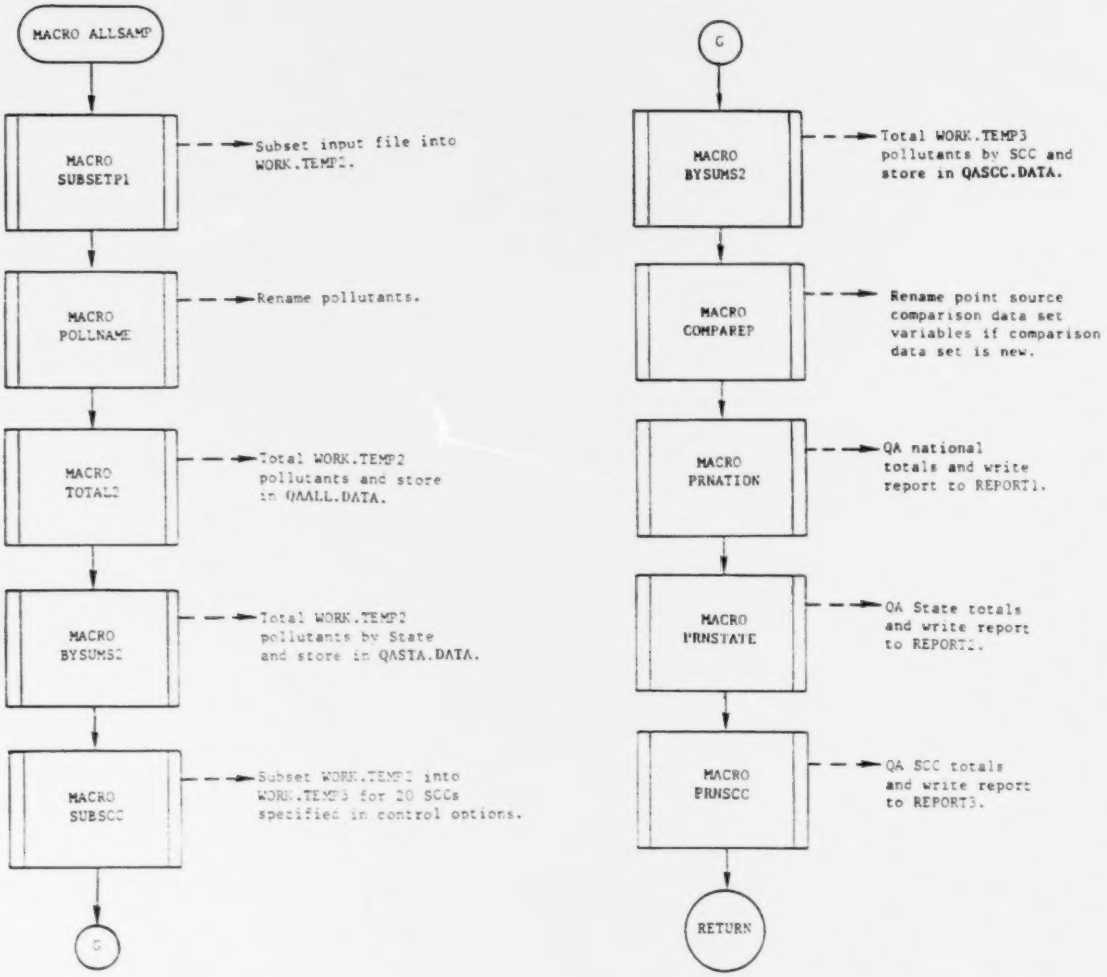

MACRO ALLHCPA
MACRO SUBSETA1
Subset input file into WORK.TEMP2.
MACRO POLLNAME
Rename pollutants
MACRO TOTAL2
Total WORK.TEMP2 pollutants and store in QAALL.DATA.
MACRO BYSUMS2
Total WORK.TEMP2 pollutants by State and store in QASTA.DATA.
B
B
MACRO SUBSCC
Subset WORK.TEMP2 into WORK.TEMP3 for 20 SCCs specified in control options.
MACRO BYSUMS2
Total WORK.TEMP3 pollutants by SCC and store in QASCC.DATA.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN


MACRO ALLMDMP
MACRO SUBSETP1
Subset input file into WORK.TEMP2, Rename pollutants.
MACRO TOTAL2
Total WORK.TEMP2 pollutants and store in QAALL.DATA.
MACRO BYSUMS2
Total WORK.TEMP2 pollutants by State and store in QASTA.DATA.
MACRO SUBSCC
Subset WORK.TEMP2 into WORK.TEMP3 for 20 SCCs specified in control options.
C
C
MACRO BYSUMS2
Total WORK.TEMP3 pollutants by SCC and store in QASCC.DATA.
MACRO COMPAREP
Rename point source comparison data set variables if comparison data set is new.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN

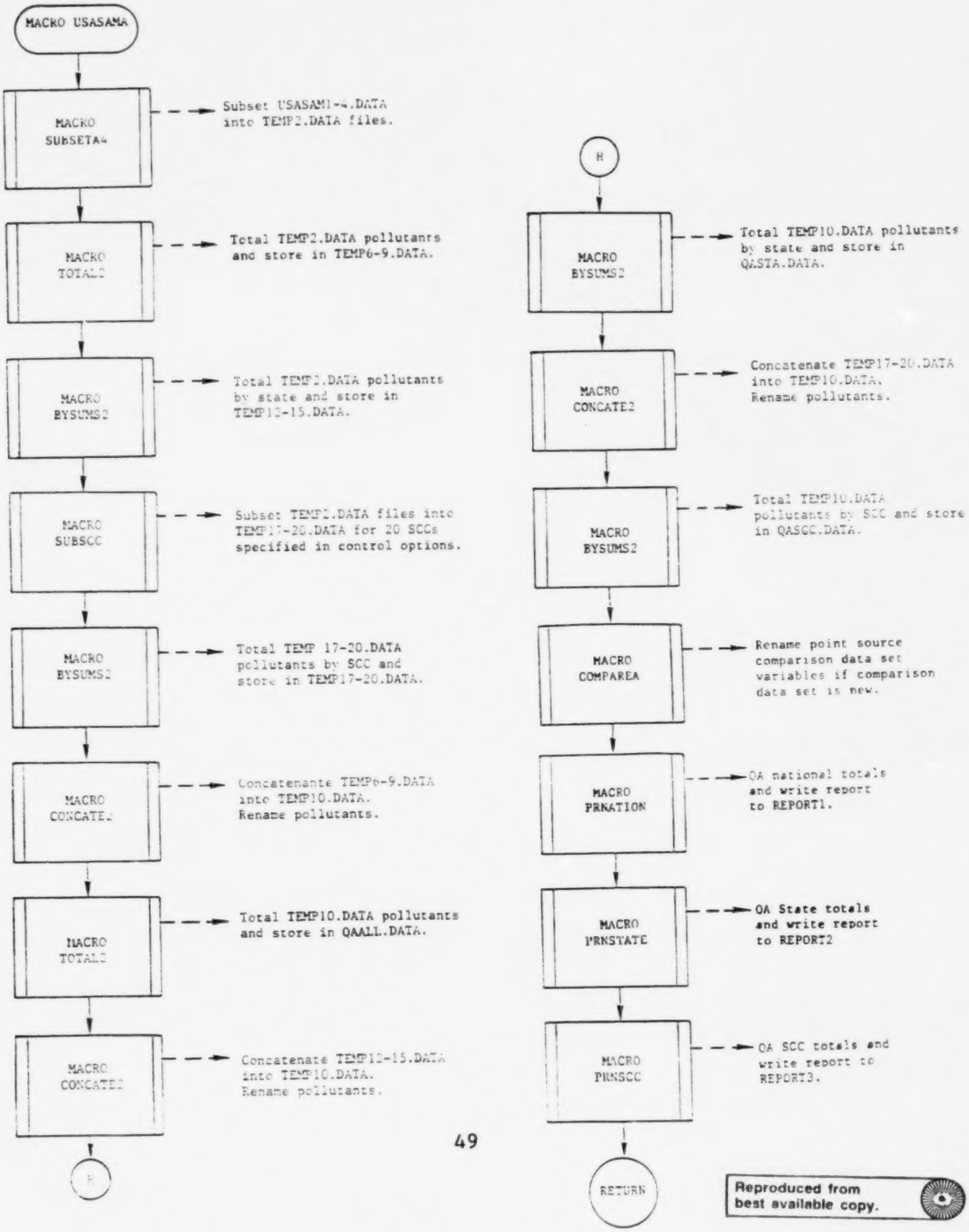

MACRO ALLMDMA
MACRO SUBSETA2
Subset input file into WORK.TEMP2. Rename pollutants.
MACRO TOTAL2
Total WORK.TEMP2 pollutants and store in QAALL.DATA.
MACRO BYSUMS2
Total WORK.TEMP2 pollutants by State and store in QASTA.DATA.
MACRO SUBSCC
Subset WORK.TEMP2 into WORK.TEMP3 for 20 SCCs specified in control options.
D
D
MACRO BYSUMS2
Total WORK.TEMP3 pollutants by SCC and store in QASCC.DATA.
MACRO COMPAREA
Rename area source comparison data set variables if comparison data set is new.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN


MACRO ALLSPMP
MACRO SUBSETP1
Subset input file into WORK.TEMP2.
MACRO POLLNAME
Rename pollutants.
MACRO TOTAL2
Total WORK.TEMP2 pollutants and store in QAALL.DATA.
MACRO BYSUMS1
Total WORK.TEMP2 pollutants by State and store in QASTA.DATA.
MACRO SUBSCC
Subset WORK.TEMP2 into WORK.TEMP3 for 20 SCCs specified in control options.
E
E
MACRO BYSUMS2
Total WORK.TEMP3 pollutants by SCC and store in QASCC.DATA.
MACRO COMPAREP
Rename point source comparison data set variables if comparison data set is new.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2.
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN

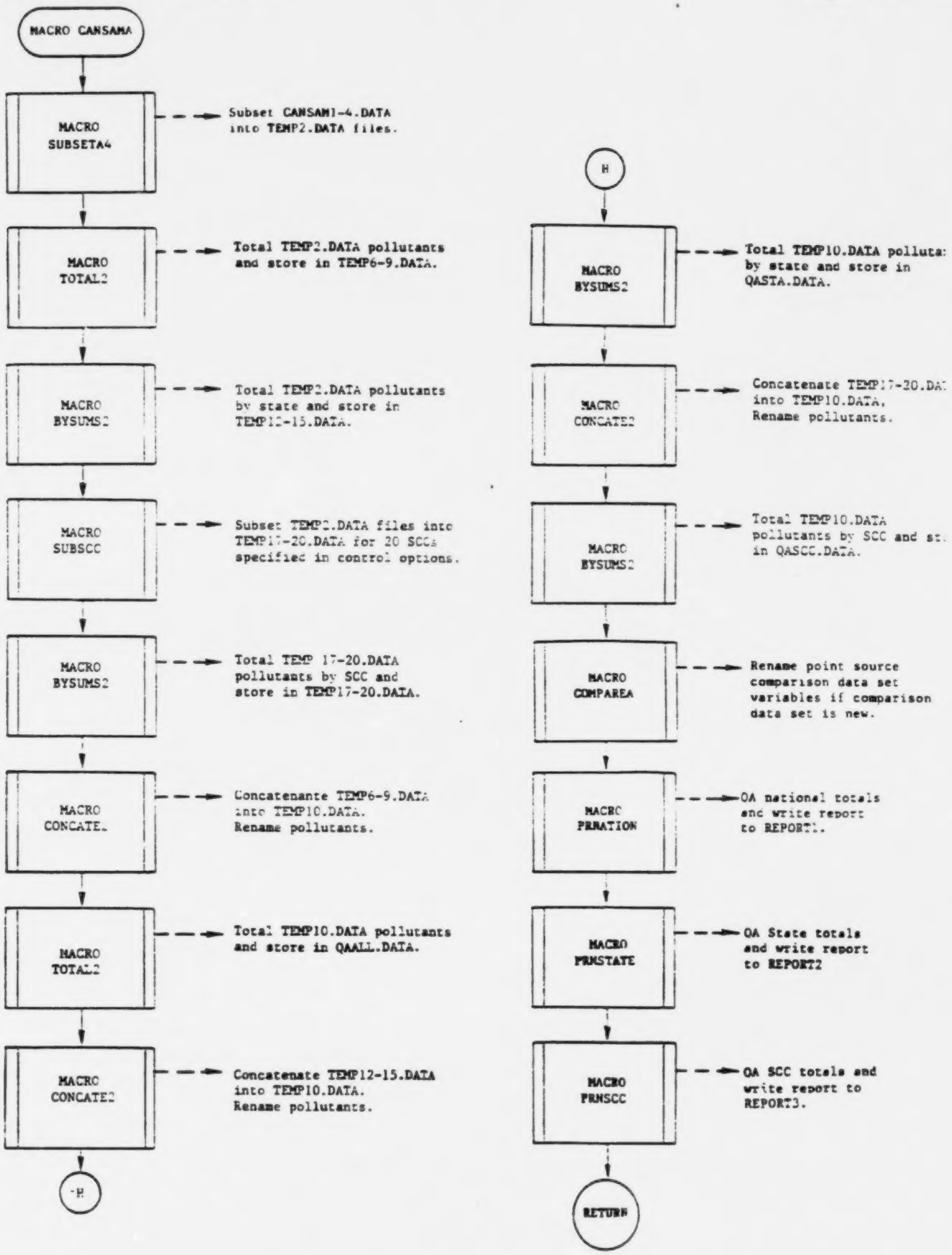

MACRO ALLSPMA
MACRO SUBSETA2
Subset input file into WORK.TEMP2, rename pollutants and species.
MACRO TOTAL2
Total WORK.TEMP2 pollutants and store in QAALL.DATA.
MACRO BYSUMS2
Total WORK.TEMP2 pollutants by State and store in QASTA.DATA.
MACRO SUBSCC
Subset WORK.TEMP2 into WORK.TEMP3 for 20 SCCs specified in control options.
MACRO BYSUMS2
Total WORK.TEMP3 pollutants by SCC and store in QASCC.DATA.
F
F
MACRO COMPAREA
Rename area source comparison data set variables if comparison data set is new.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2.
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN

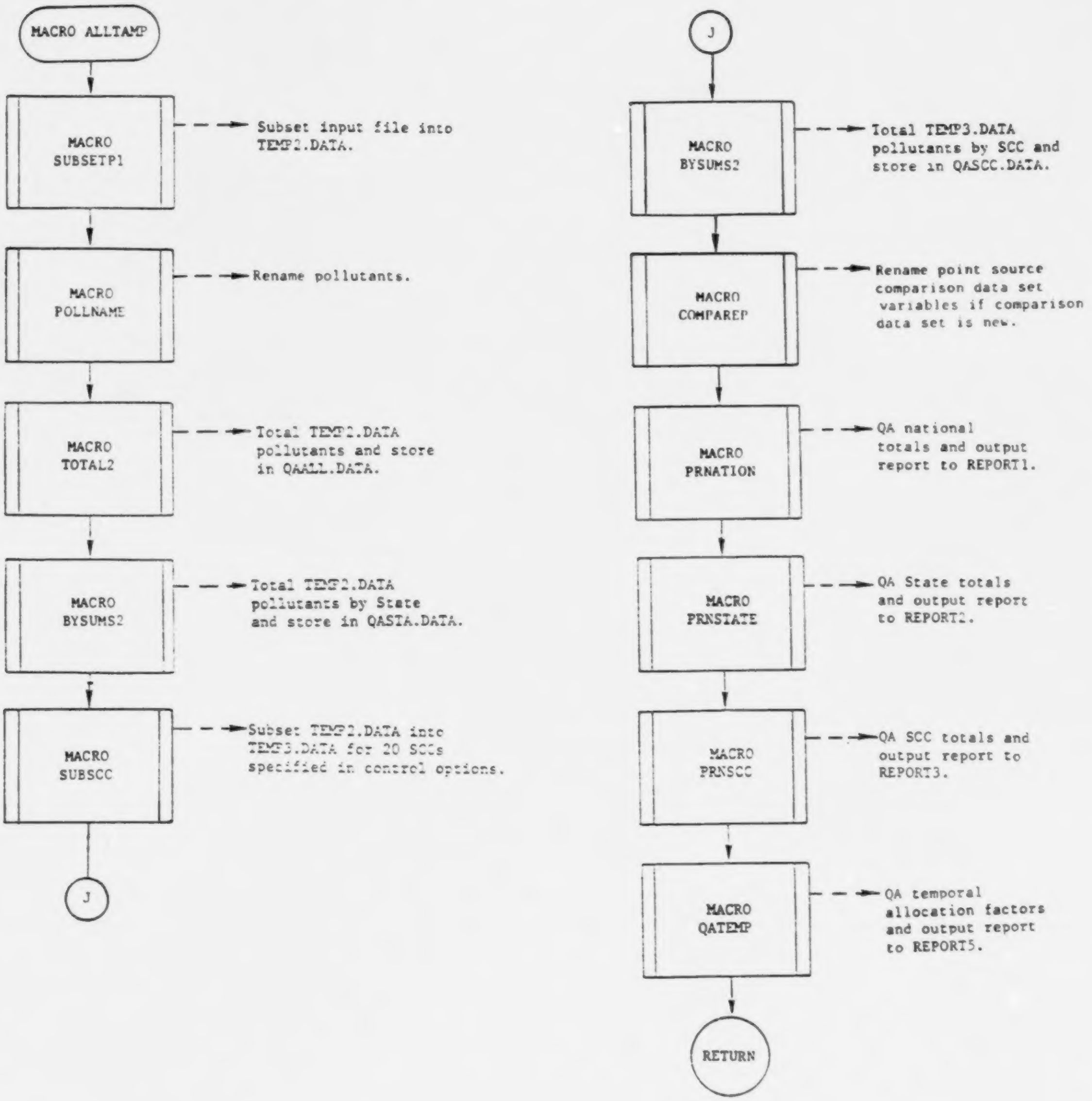

MACRO ALLSAMP
MACRO SUBSETP1
Subset input file into WORK.TEMP2.
MACRO POLLNAME
Rename pollutants.
MACRO TOTAL2
Total WORK.TEMP2 pollutants and store in QAALL.DATA.
MACRO BYSUMS2
Total WORK.TEMP2 pollutants by State and store in QASTA.DATA.
MACRO SUBSCC
Subset WORK.TEMP2 into WORK.TEMP3 for 20 SCCs specified in control options.
C
C
MACRO BYSUMS2
Total WORK.TEMP3 pollutants by SCC and store in QASCC.DATA.
MACRO COMPAREP
Rename point source comparison data set variables if comparison data set is new.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2.
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN

Quality Control Module --


MACRO USASAMA
MACRO SUBSETA4
Subset USASAM1-4.DATA into TEMP2.DATA files.
MACRO TOTAL2
Total TEMP2.DATA pollutants and store in TEMP6-9.DATA.
MACRO BYSUMS2
Total TEMP2.DATA pollutants by state and store in TEMP12-15.DATA.
MACRO SUBSCC
Subset TEMP2.DATA files into TEMP17-20.DATA for 20 SCCs specified in control options.
MACRO BYSUMS2
Total TEMP 17-20.DATA pollutants by SCC and store in TEMP17-20.DATA.
MACRO CONCATE2
Concatenante TEMP6-9.DATA into TEMP10.DATA. Rename pollutants.
MACRO TOTAL2
Total TEMP10.DATA pollutants and store in QAALL.DATA.
MACRO CONCATE2
Concatenate TEMP12-15.DATA into TEMP10.DATA. Rename pollutants.
H
H
MACRO BYSUMS2
Total TEMP10.DATA pollutants by state and store in QASTA.DATA.
MACRO CONCATE2
Concatenate TEMP17-20.DATA into TEMP10.DATA. Rename pollutants.
MACRO BYSUMS2
Total TEMP10.DATA pollutants by SCC and store in QASCC.DATA.
MACRO COMPAREA
Rename point source comparison data set variables if comparison data set is new.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN

Reproduced from best available copy.


MACRO CANSAMA
MACRO SUBSETA4
Subset CANSAM1-4.DATA into TEMP2.DATA files.
MACRO TOTAL2
Total TEMP2.DATA pollutants and store in TEMP6-9.DATA.
MACRO BYSUMS2
Total TEMP2.DATA pollutants by state and store in TEMP12-15.DATA.
MACRO SUBSCC
Subset TEMP2.DATA files into TEMP17-20.DATA for 20 SCCs specified in control options.
MACRO BYSUMS2
Total TEMP 17-20.DATA pollutants by SCC and store in TEMP17-20.DATA.
MACRO CONCATE1
Concatenante TEMP6-9.DATA into TEMP10.DATA. Rename pollutants.
MACRO TOTAL2
Total TEMP10.DATA pollutants and store in QAALL.DATA.
MACRO CONCATE2
Concatenate TEMP12-15.DATA into TEMP10.DATA. Rename pollutants.
H
H
MACRO BYSUMS2
Total TEMP10.DATA polluta by state and store in QASTA.DATA.
MACRO CONCATE2
Concatenate TEMP17-20.DA into TEMP10.DATA. Rename pollutants.
MACRO BYSUMS2
Total TEMP10.DATA pollutants by SCC and st in QASCC.DATA.
MACRO COMPAREA
Rename point source comparison data set variables if comparison data set is new.
MACRO PRNATION
QA national totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN


MACRO ALLTAMP
MACRO SUBSETP1
MACRO POLLNAME
MACRO TOTAL2
MACRO BYSUMS2
MACRO SUBSCC
J
J
MACRO BYSUMS2
MACRO COMPAREP
MACRO PRNATION
MACRO PRNSTATE
MACRO PRNSCC
MACRO QATEMP
RETURN

Subset input file into TEMP2.DATA.

Rename pollutants.

Total TEMP2.DATA pollutants and store in QAALL.DATA.

Total TEMP2.DATA pollutants by State and store in QASTA.DATA.

Subset TEMP2.DATA into TEMP3.DATA for 20 SCCs specified in control options.

Total TEMP3.DATA pollutants by SCC and store in QASCC.DATA.

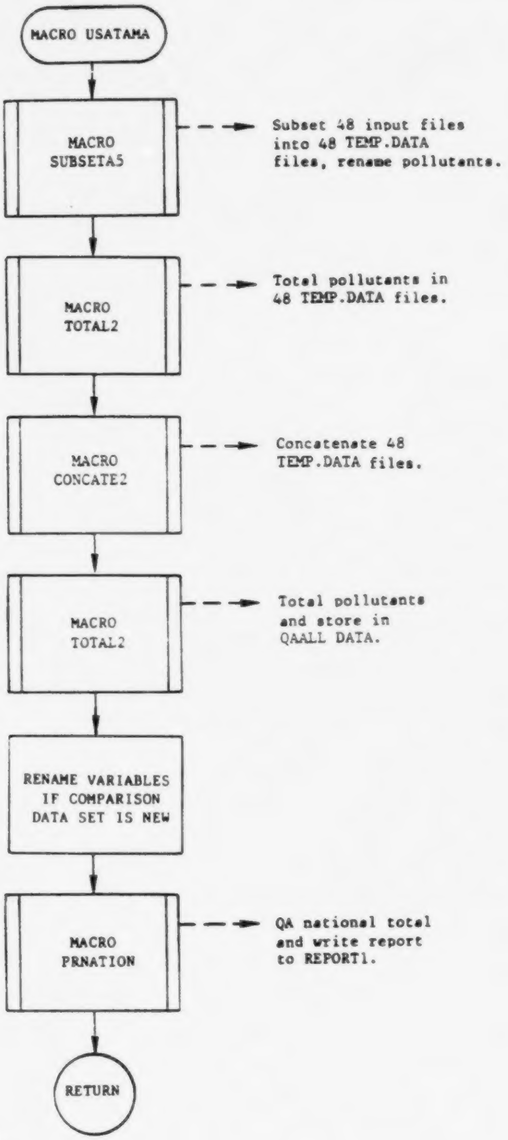
Rename point source comparison data set variables if comparison data set is new.

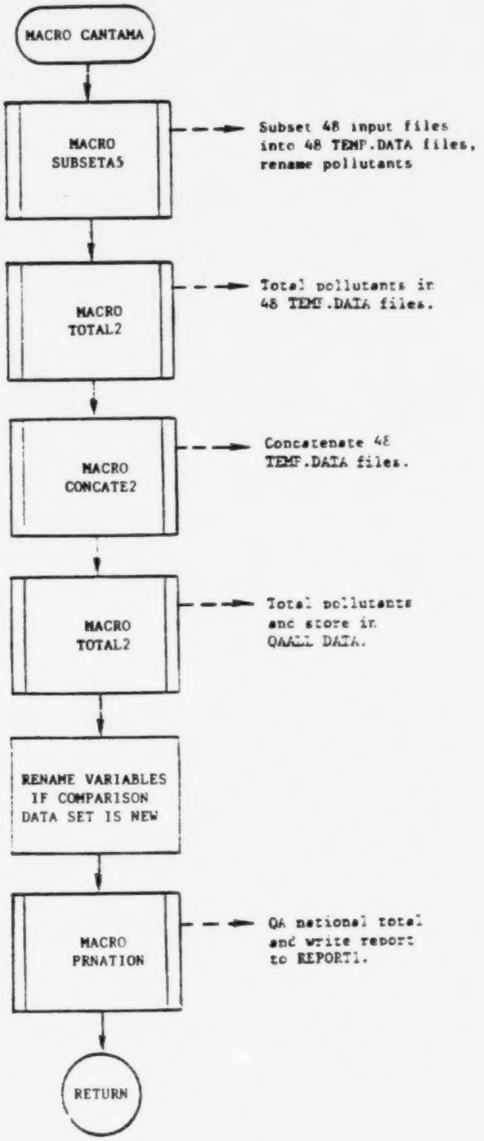
QA national totals and output report to REPORT1.

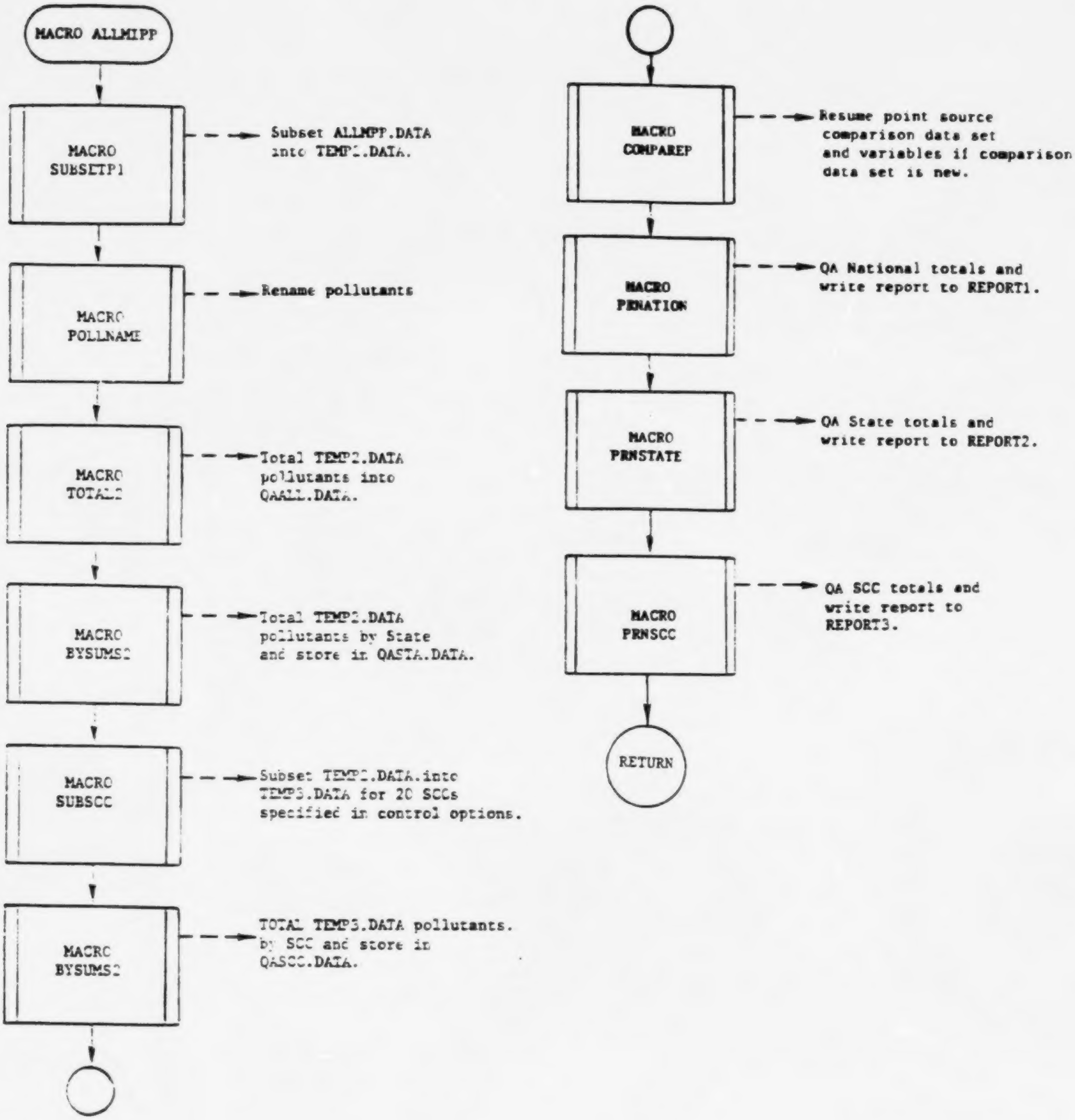
QA State totals and output report to REPORT2.

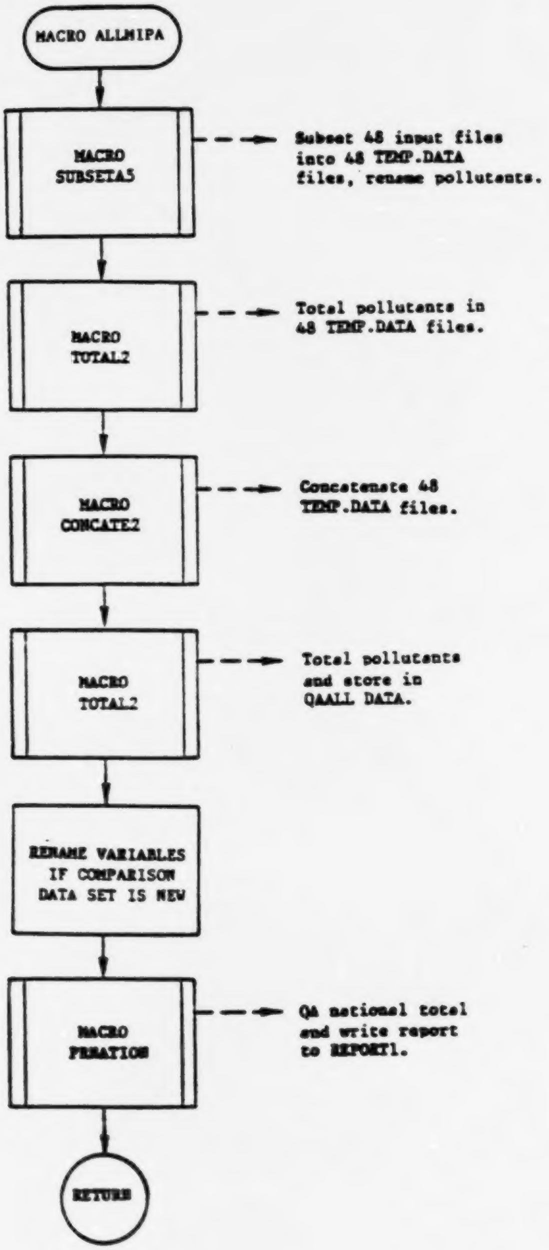
QA SCC totals and output report to REPORT3.

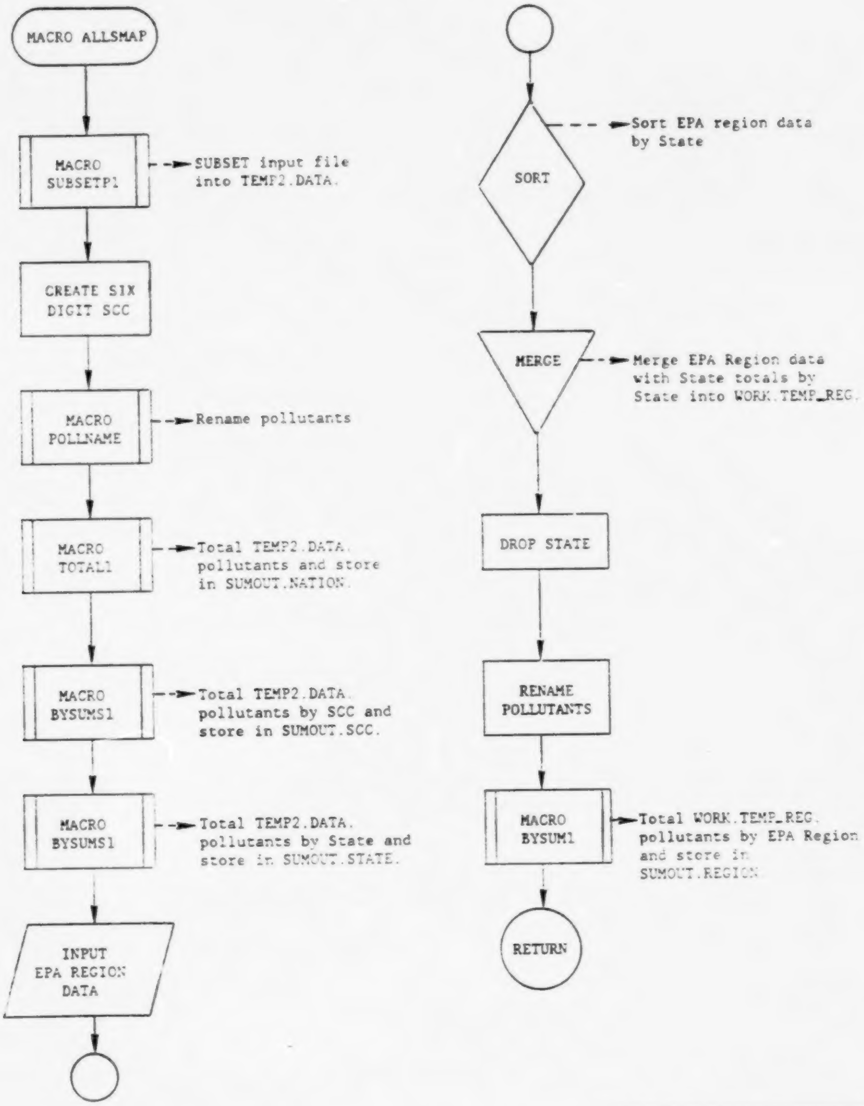
QA temporal allocation factors and output report to REPORT5.


MACRO USATAMA
MACRO SUBSETA5
Subset 48 input files into 48 TEMP.DATA files, rename pollutants.
MACRO TOTAL2
Total pollutants in 48 TEMP.DATA files.
MACRO CONCATE2
Concatenate 48 TEMP.DATA files.
MACRO TOTAL2
Total pollutants and store in QAALL DATA.
RENAME VARIABLES IF COMPARISON DATA SET IS NEW
MACRO PRNATION
QA national total and write report to REPORT1.
RETURN

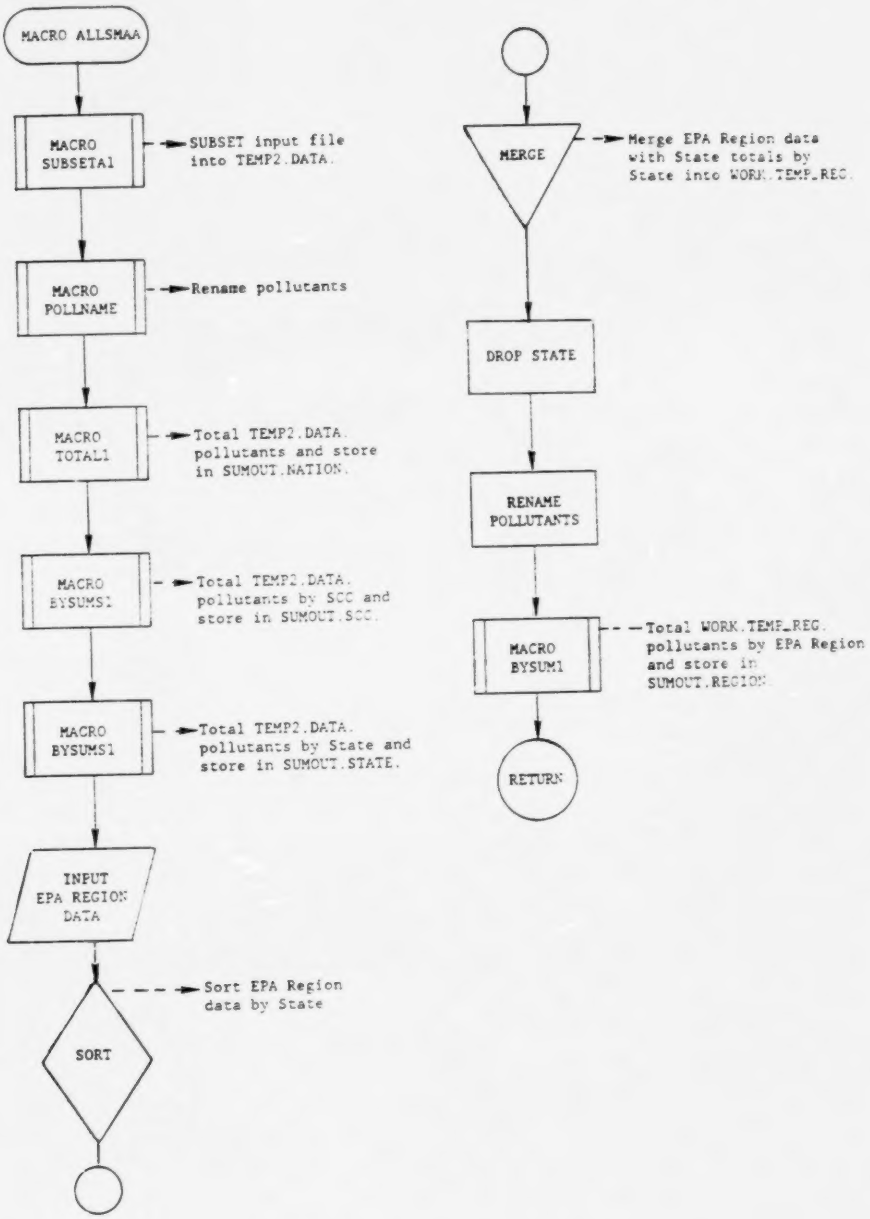

MACRO CANTAMA
MACRO SUBSETA5
Subset 48 input files into 48 TEMP.DATA files, rename pollutants
MACRO TOTAL2
Total pollutants in 48 TEMP.DATA files.
MACRO CONCATE2
Concatenate 48 TEMP.DATA files.
MACRO TOTAL2
Total pollutants and store in QAALL DATA.
RENAME VARIABLES IF COMPARISON DATA SET IS NEW
MACRO PRNATION
QA national total and write report to REPORT1.
RETURN


MACRO ALLMIPP
MACRO SUBSETP1
Subset ALLMPP.DATA into TEMP1.DATA.
MACRO POLLNAME
Rename pollutants
MACRO TOTAL2
Total TEMP2.DATA pollutants into QAALL.DATA.
MACRO BYSUMS2
Total TEMP2.DATA pollutants by State and store in QASTA.DATA.
MACRO SUBSCC
Subset TEMP1.DATA.into TEMP3.DATA for 20 SCCs specified in control options.
MACRO BYSUMS2
TOTAL TEMP3.DATA pollutants. by SCC and store in QASCC.DATA.
MACRO COMPAREP
Resume point source comparison data set and variables if comparison data set is new.
MACRO PRNATION
QA National totals and write report to REPORT1.
MACRO PRNSTATE
QA State totals and write report to REPORT2.
MACRO PRNSCC
QA SCC totals and write report to REPORT3.
RETURN

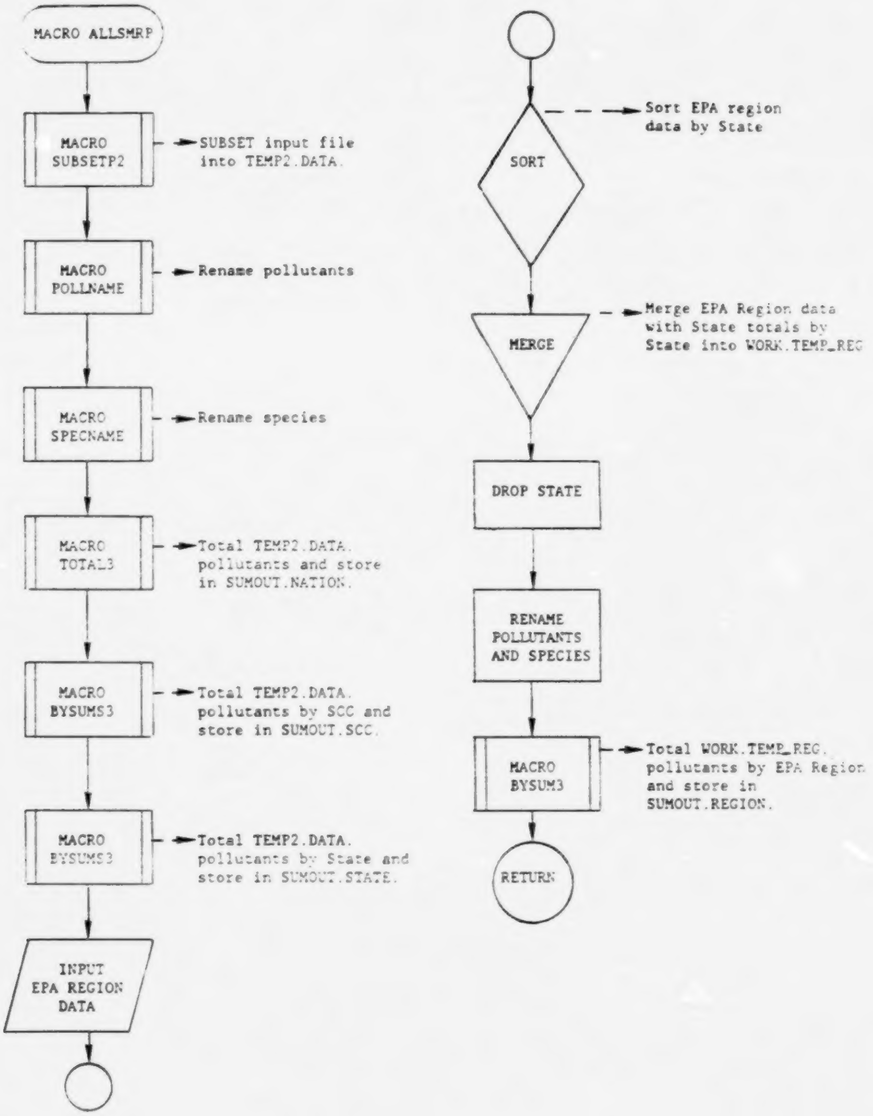

MACRO ALLNIPA
MACRO SUBSETA5
Subset 48 input files into 48 TEMP.DATA files, rename pollutants.
MACRO TOTAL2
Total pollutants in 48 TEMP.DATA files.
MACRO CONCATE2
Concatenate 48 TEMP.DATA files.
MACRO TOTAL2
Total pollutants and store in QAALL DATA.
RENAME VARIABLES IF COMPARISON DATA SET IS NEW
MACRO PRNATION
QA national total and write report to REPORT1.
RETURN

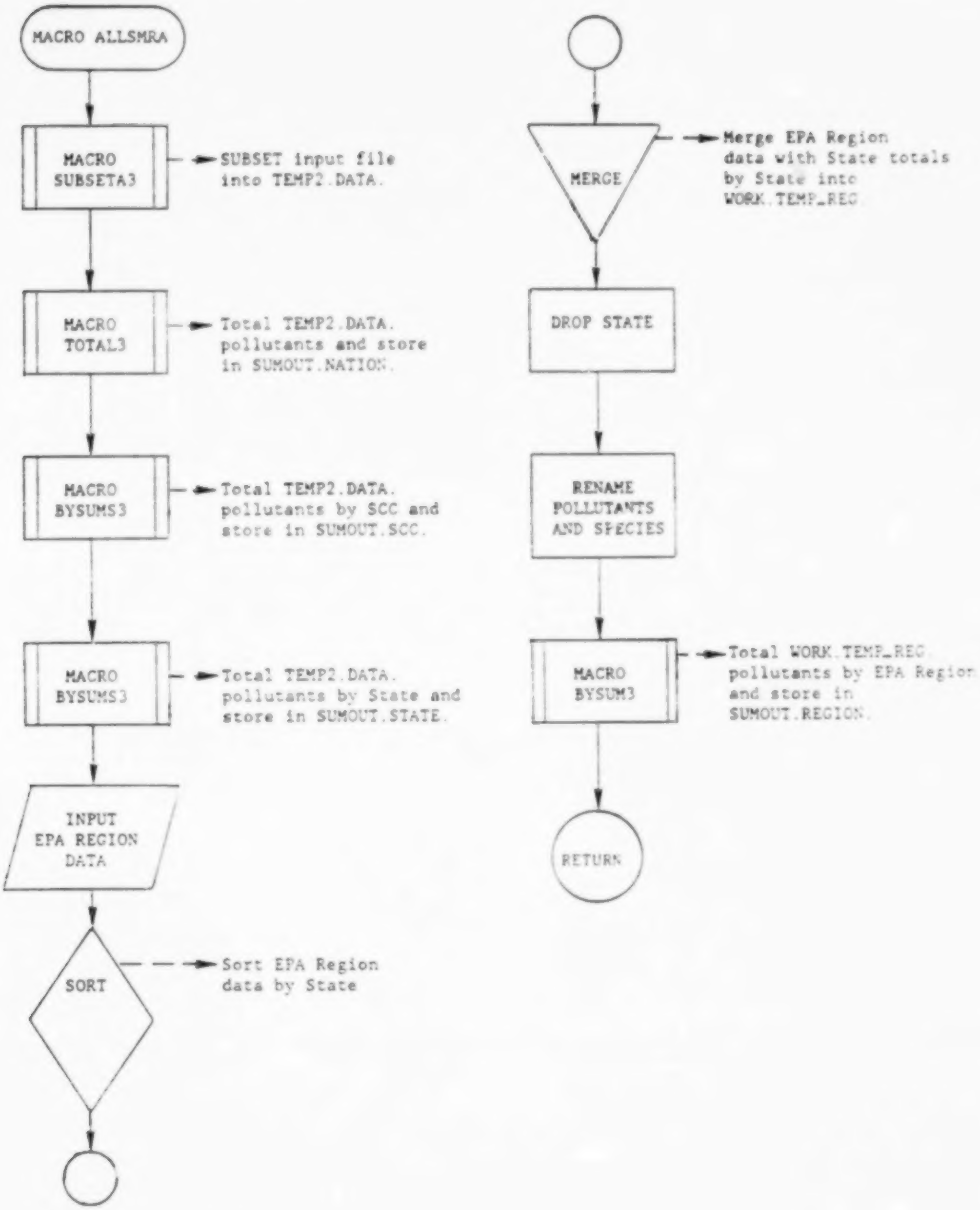

MACRO ALLSMAP
MACRO SUBSETP1
SUBSET input file into TEMP2.DATA.
CREATE SIX DIGIT SCC
MACRO POLLNAME
Rename pollutants
MACRO TOTAL1
Total TEMP2.DATA. pollutants and store in SUMOUT.NATION.
MACRO BYSUMS1
Total TEMP2.DATA. pollutants by SCC and store in SUMOUT.SCC.
MACRO BYSUMS1
Total TEMP2.DATA. pollutants by State and store in SUMOUT.STATE.
INPUT EPA REGION DATA
SORT
Sort EPA region data by State
MERGE
Merge EPA Region data with State totals by State into WORK.TEMP_REG.
DROP STATE
RENAME POLLUTANTS
MACRO BYSUM1
Total WORK.TEMP_REG. pollutants by EPA Region and store in SUMOUT.REGION.
RETURN

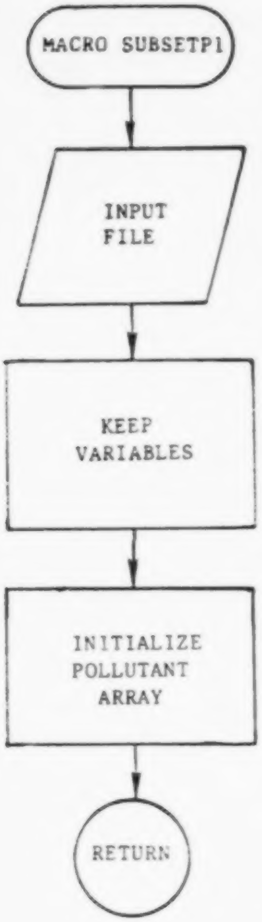
Reproduced from best available copy.

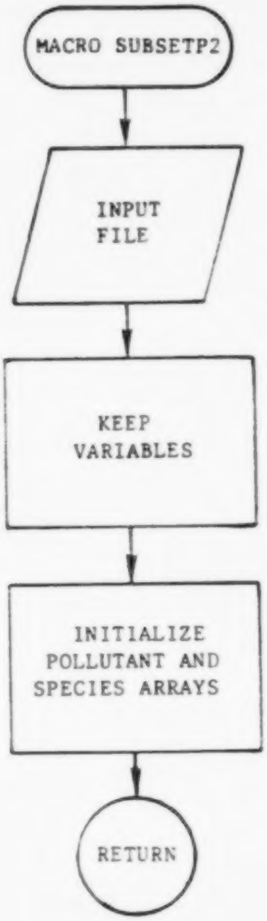

MACRO ALLSMAA
MACRO SUBSETA1
SUBSET input file into TEMP2.DATA.
MACRO POLLNAME
Rename pollutants
MACRO TOTAL1
Total TEMP2.DATA. pollutants and store in SUMOUT.NATION.
MACRO BYSUMS1
Total TEMP2.DATA. pollutants by SCC and store in SUMOUT.SCC.
MACRO BYSUMS1
Total TEMP2.DATA. pollutants by State and store in SUMOUT.STATE.
INPUT EPA REGION DATA
Sort EPA Region data by State
SORT
MERGE
Merge EPA Region data with State totals by State into WORK.TEMP_REG.
DROP STATE
RENAME POLLUTANTS
MACRO BYSUM1
Total WORK.TEMP_REG. pollutants by EPA Region and store in SUMOUT.REGION.
RETURN

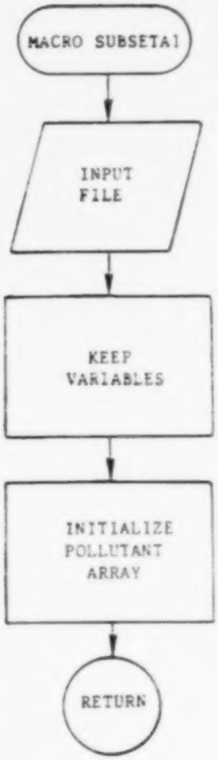
Quality Control Module --

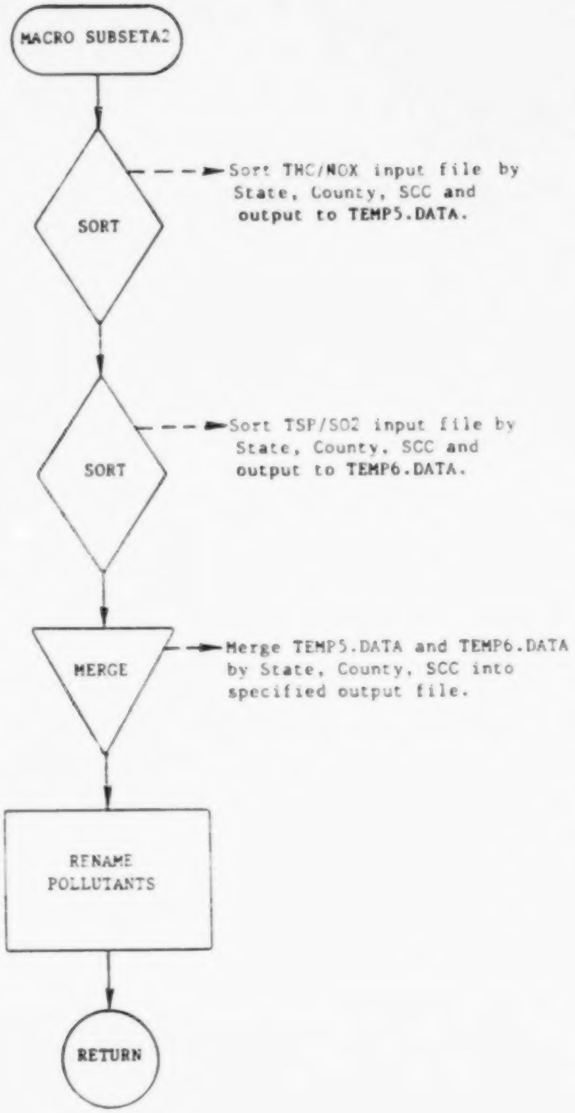

MACRO ALLSMRP
MACRO SUBSETP2
SUBSET input file into TEMP2.DATA.
MACRO POLLNAME
Rename pollutants
MACRO SPECNAME
Rename species
MACRO TOTAL3
Total TEMP2.DATA. pollutants and store in SUMOUT.NATION.
MACRO BYSUMS3
Total TEMP2.DATA. pollutants by SCC and store in SUMOUT.SCC.
MACRO BYSUMS3
Total TEMP2.DATA. pollutants by State and store in SUMOUT.STATE.
INPUT EPA REGION DATA
SORT
Sort EPA region data by State
MERGE
Merge EPA Region data with State totals by State into WORK.TEMP_REG
DROP STATE
RENAME POLLUTANTS AND SPECIES
MACRO BYSUM3
Total WORK.TEMP_REG. pollutants by EPA Region and store in SUMOUT.REGION.
RETURN


MACRO ALLSMRA
MACRO SUBSETA3
SUBSET input file into TEMP2.DATA.
MACRO TOTAL3
Total TEMP2.DATA. pollutants and store in SUMOUT.NATION.
MACRO BYSUMS3
Total TEMP2.DATA. pollutants by SCC and store in SUMOUT.SCC.
MACRO BYSUMS3
Total TEMP2.DATA. pollutants by State and store in SUMOUT.STATE.
INPUT EPA REGION DATA
SORT
Sort EPA Region data by State
MERGE
Merge EPA Region data with State totals by State into WORK.TEMP_REG
DROP STATE
RENAME POLLUTANTS AND SPECIES
MACRO BYSUM3
Total WORK.TEMP_REG pollutants by EPA Region and store in SUMOUT.REGION.
RETURN


MACRO SUBSETP1
INPUT FILE
KEEP VARIABLES
INITIALIZE POLLUTANT ARRAY
RETURN


MACRO SUBSETP2
INPUT FILE
KEEP VARIABLES
INITIALIZE POLLUTANT AND SPECIES ARRAYS
RETURN

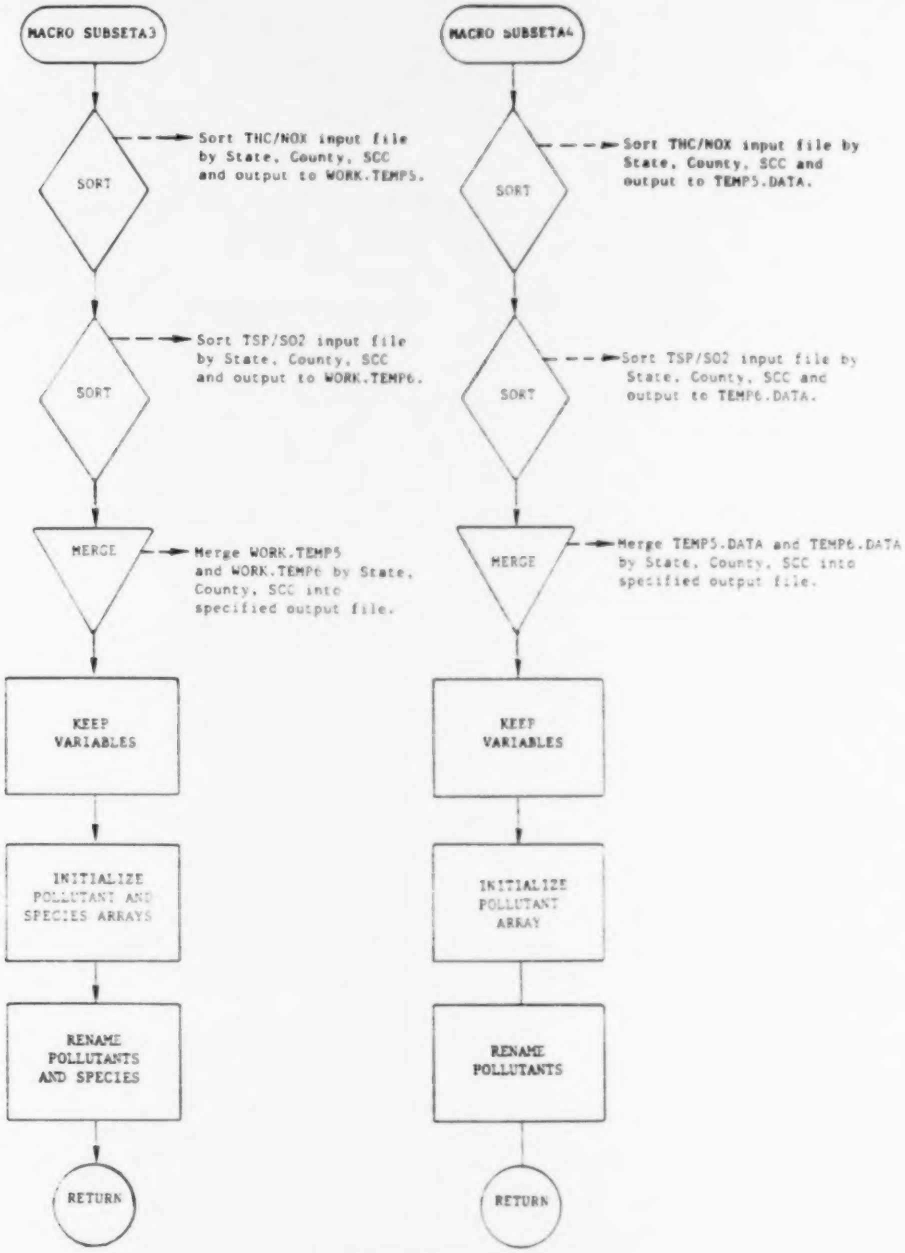

MACRO SUBSETA1
INPUT FILE
KEEP VARIABLES
INITIALIZE POLLUTANT ARRAY
RETURN

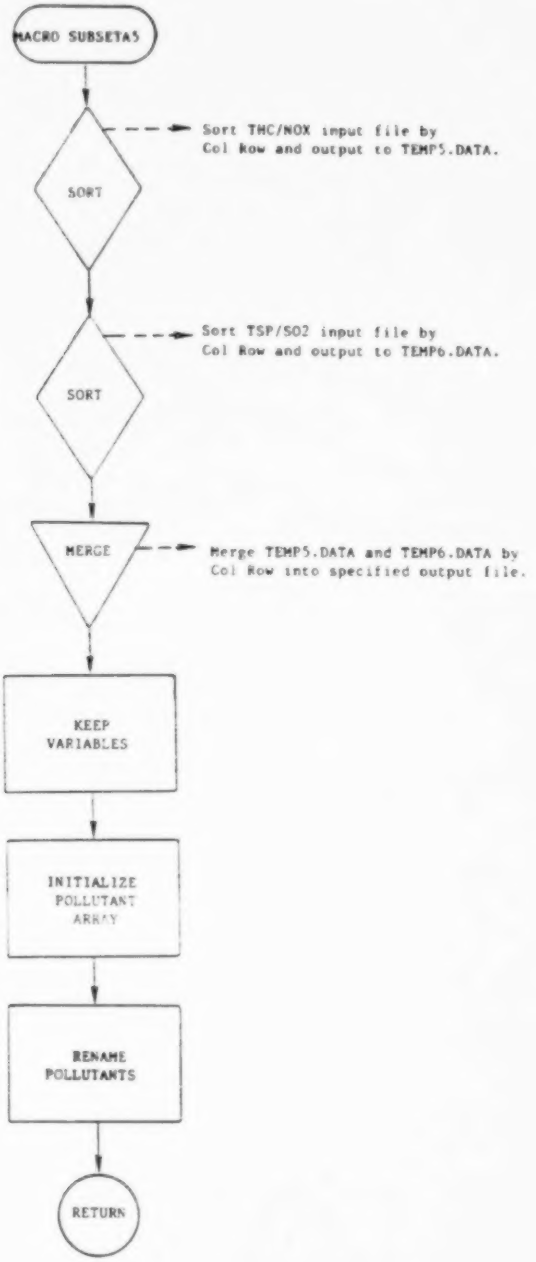

MACRO SUBSETA2
SORT
SORT
MERGE
RENAME POLLUTANTS
RETURN

Sort THC/NOX input file by State, County, SCC and output to TEMP5.DATA.

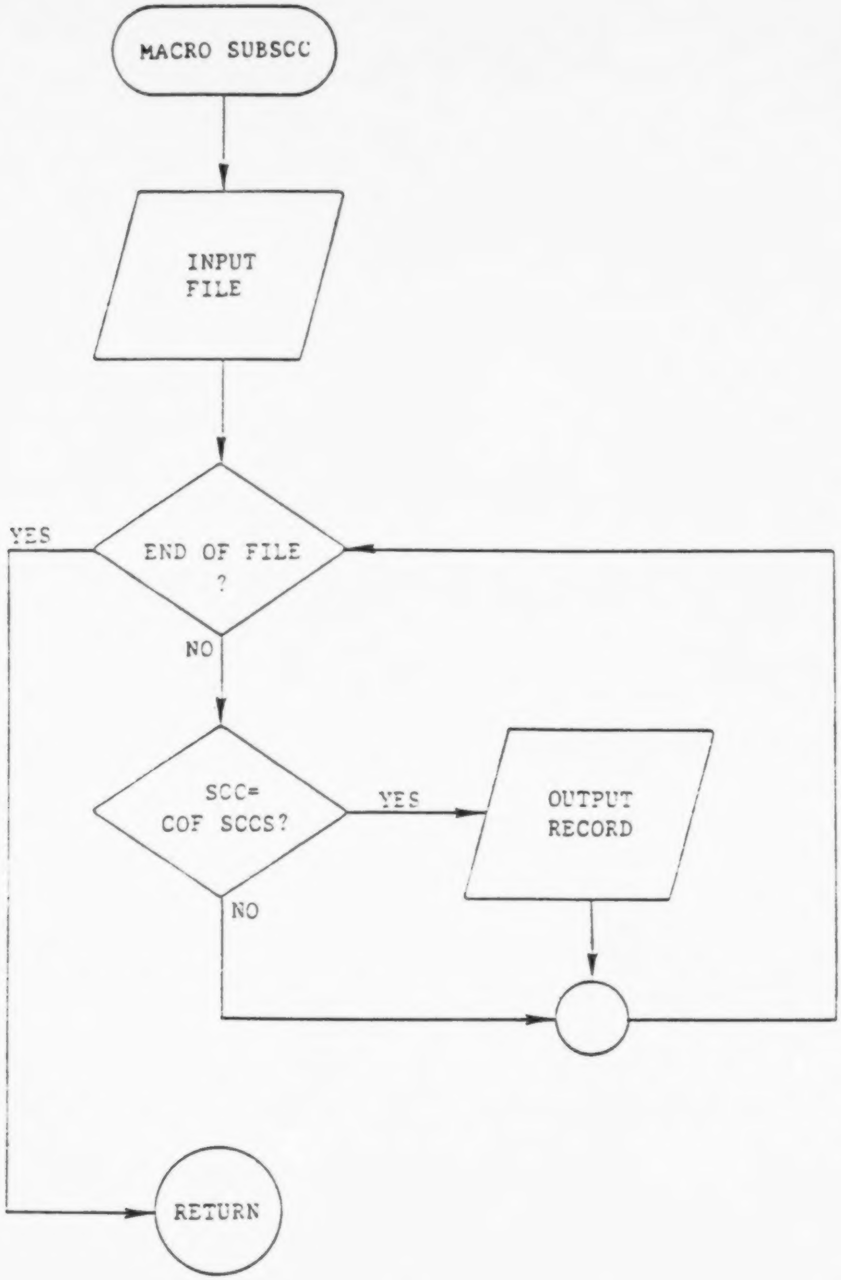
Sort TSP/SO2 input file by State, County, SCC and output to TEMP6.DATA.

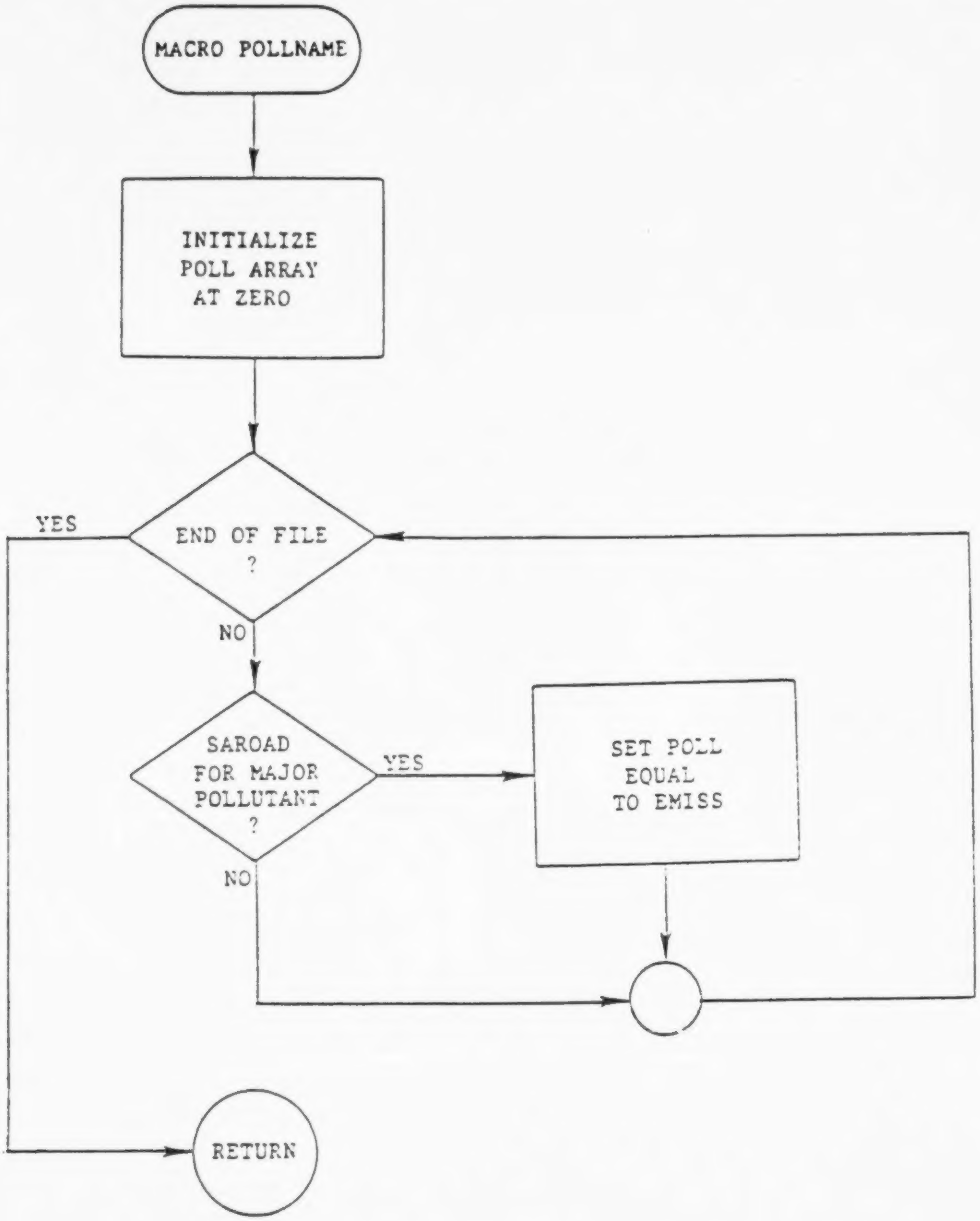
Merge TEMP5.DATA and TEMP6.DATA by State, County, SCC into specified output file.

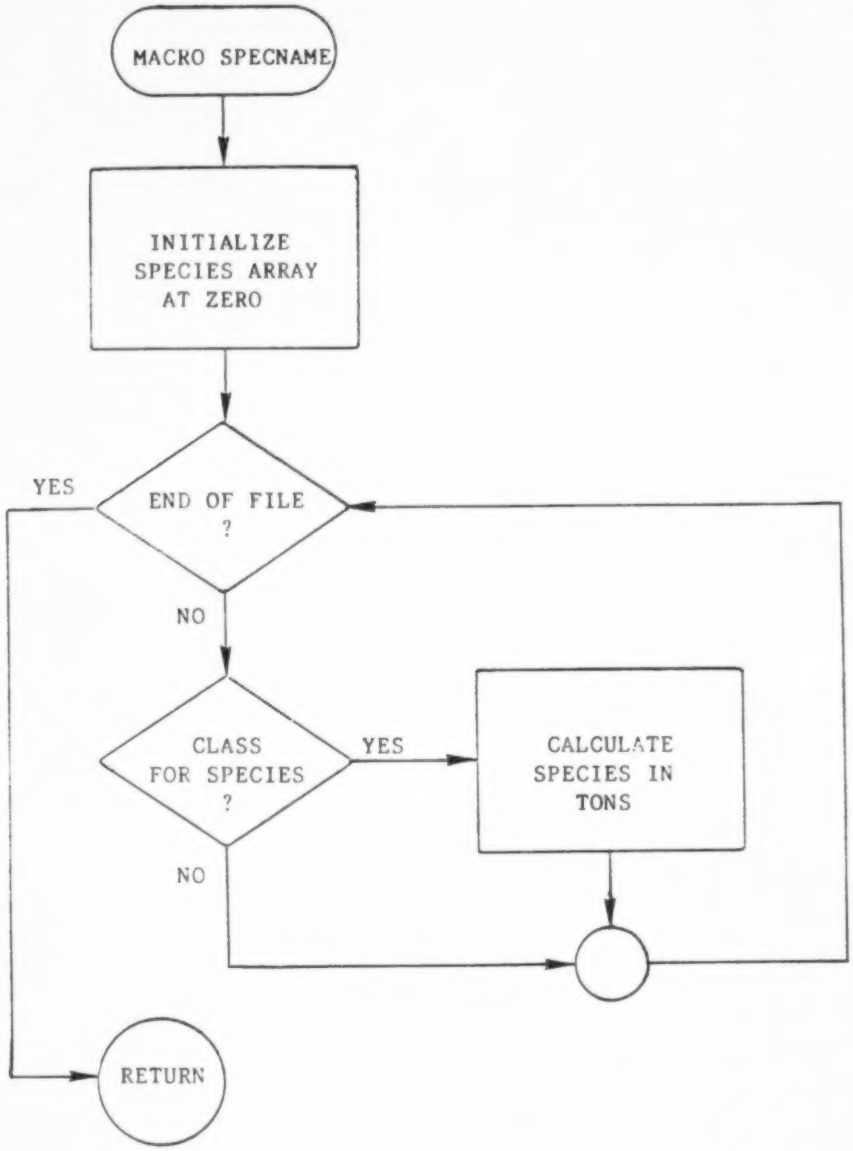

MACRO SUBSETA3
SORT
Sort THC/NOX input file by State, County, SCC and output to WORK.TEMP5.
SORT
Sort TSP/SO2 input file by State, County, SCC and output to WORK.TEMP6.
MERGE
Merge WORK.TEMP5 and WORK.TEMP6 by State, County, SCC into specified output file.
KEEP VARIABLES
INITIALIZE POLLUTANT AND SPECIES ARRAYS
RENAME POLLUTANTS AND SPECIES
RETURN
MACRO SUBSETA4
SORT
Sort THC/NOX input file by State, County, SCC and output to TEMP5.DATA.
SORT
Sort TSP/SO2 input file by State, County, SCC and output to TEMP6.DATA.
MERGE
Merge TEMP5.DATA and TEMP6.DATA by State, County, SCC into specified output file.
KEEP VARIABLES
INITIALIZE POLLUTANT ARRAY
RENAME POLLUTANTS
RETURN

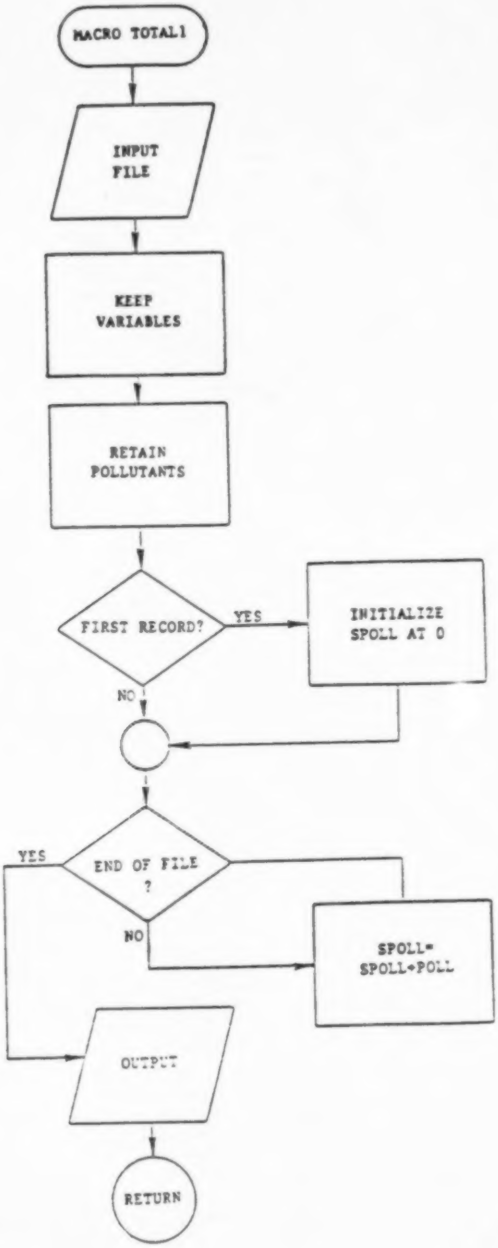

MACRO SUBSETA5
SORT
Sort THC/NOX input file by Col Row and output to TEMP5.DATA.
SORT
Sort TSP/SO2 input file by Col Row and output to TEMP6.DATA.
MERGE
Merge TEMP5.DATA and TEMP6.DATA by Col Row into specified output file.
KEEP VARIABLES
INITIALIZE POLLUTANT ARRAY
RENAME POLLUTANTS
RETURN

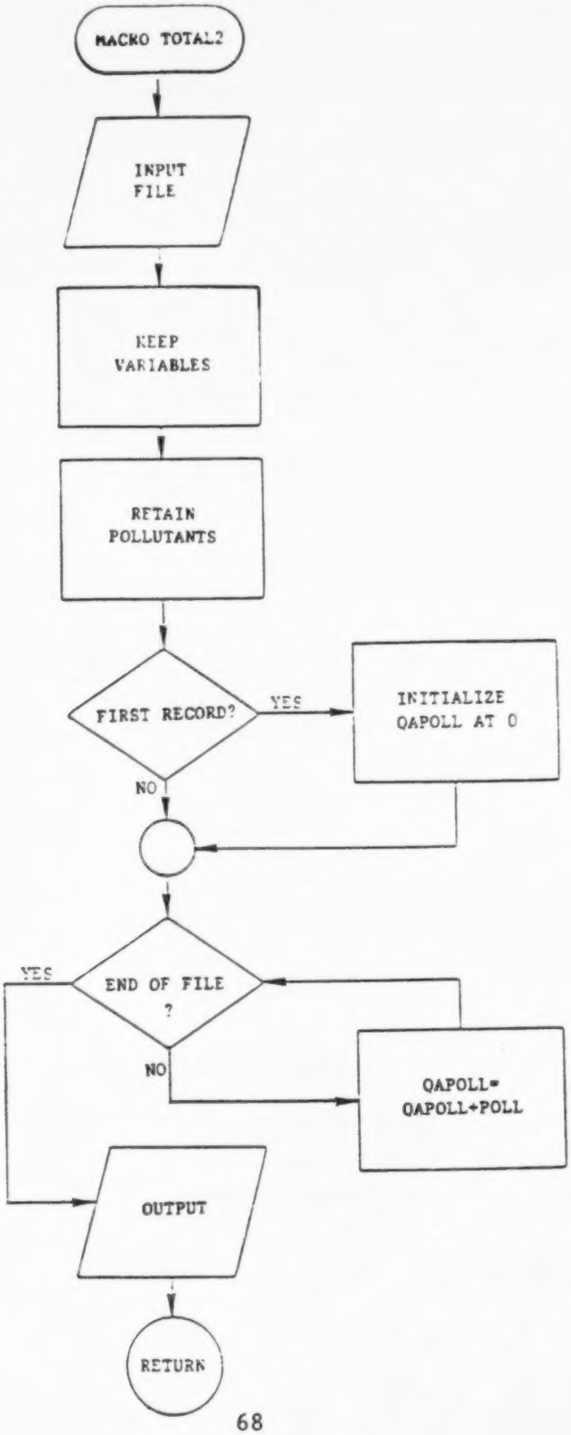
Quality Control Module --

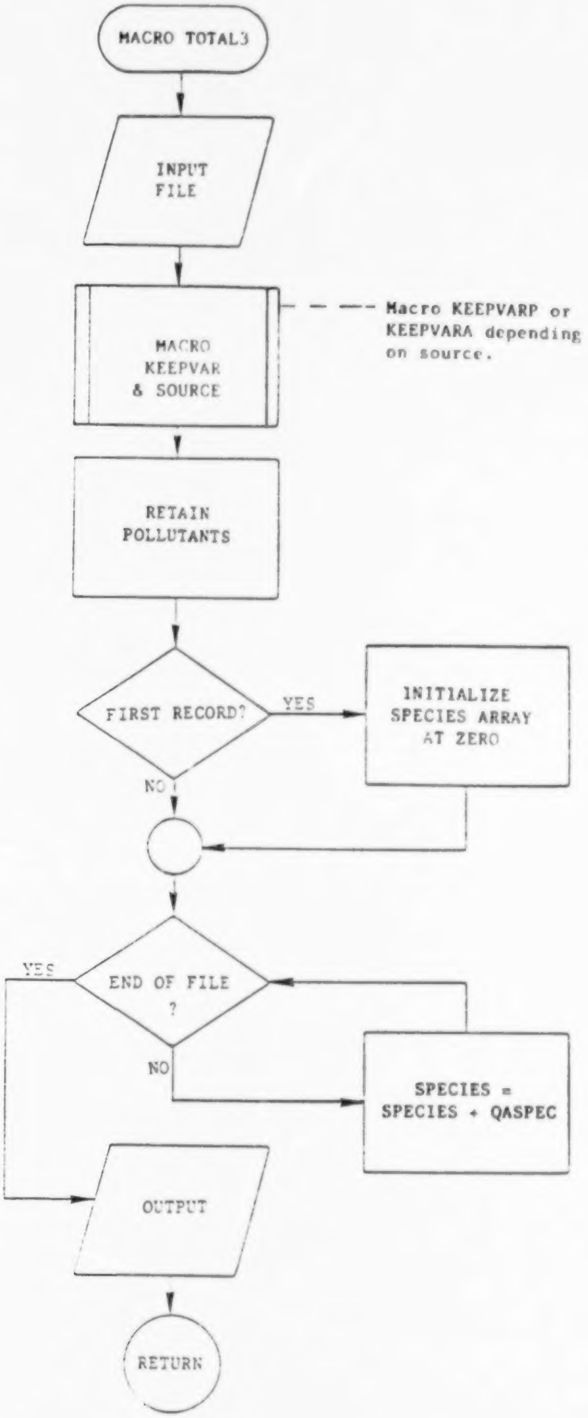

MACRO SUBSCC
INPUT FILE
END OF FILE ?
YES
NO
SCC= COF SCCS?
YES
OUTPUT RECORD
NO
RETURN

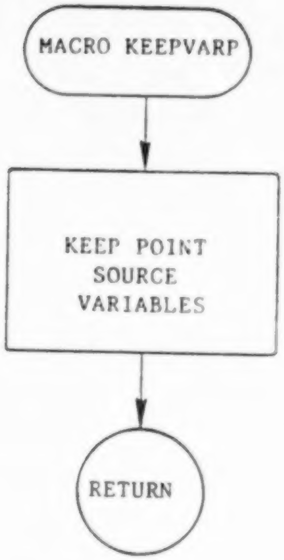

MACRO POLLNAME
INITIALIZE POLL ARRAY AT ZERO
END OF FILE ?
YES
NO
SAROAD FOR MAJOR POLLUTANT ?
YES
NO
SET POLL EQUAL TO EMISS
RETURN

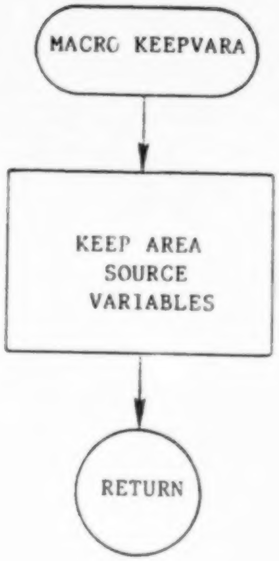

MACRO SPECNAME
INITIALIZE SPECIES ARRAY AT ZERO
END OF FILE ?
YES
NO
CLASS FOR SPECIES ?
YES
CALCULATE SPECIES IN TONS
NO
RETURN

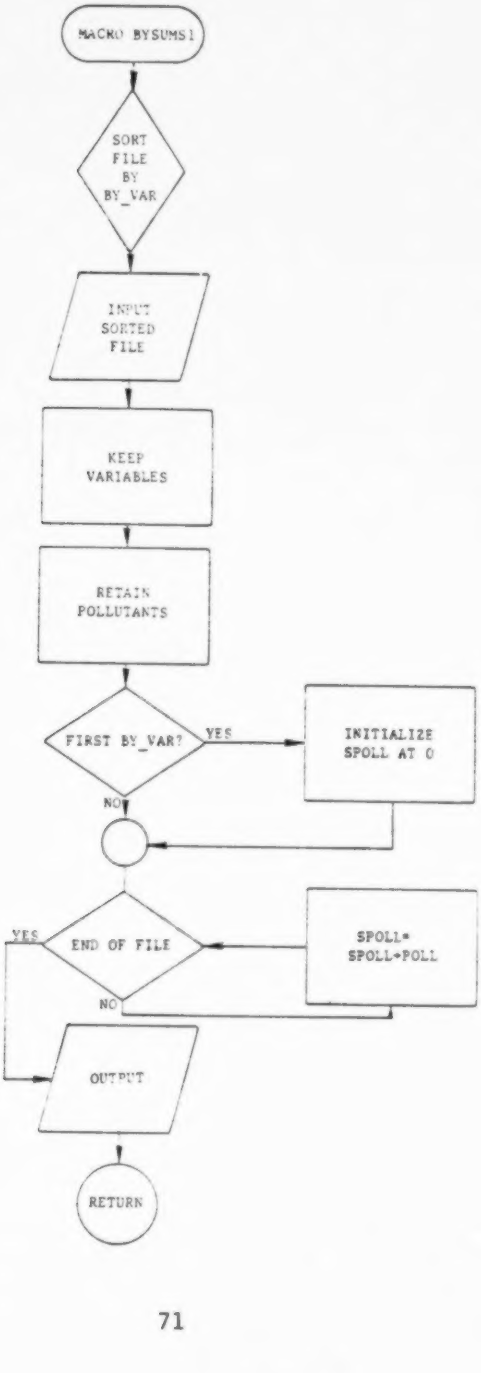

MACRO TOTAL1
INPUT FILE
KEEP VARIABLES
RETAIN POLLUTANTS
FIRST RECORD?
YES
INITIALIZE SPOLL AT 0
NO
END OF FILE ?
YES
NO
SPOLL= SPOLL+POLL
OUTPUT
RETURN

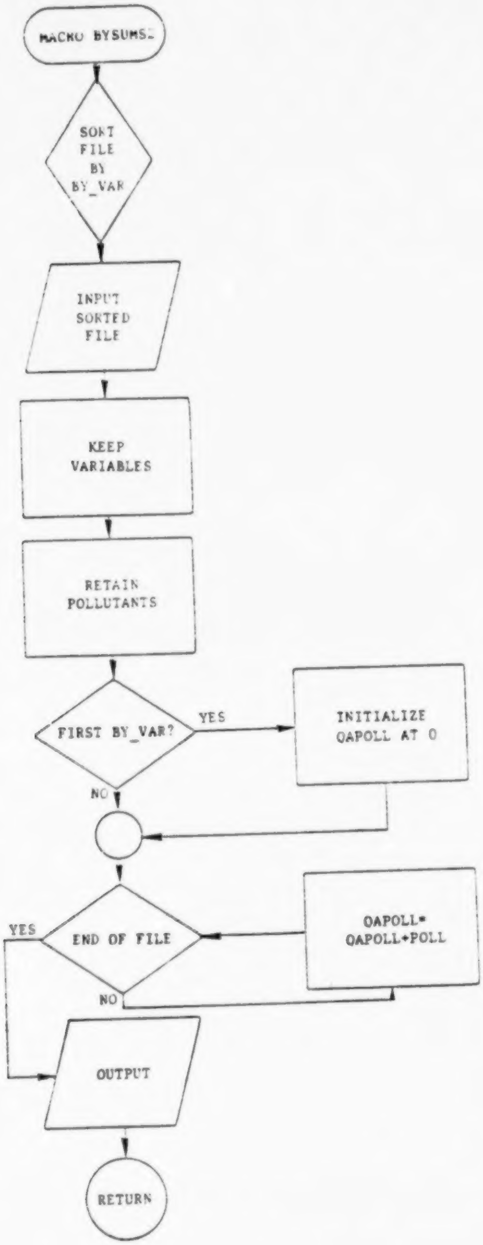

MACRO TOTAL2
INPUT FILE
KEEP VARIABLES
RETAIN POLLUTANTS
FIRST RECORD?
YES
INITIALIZE QAPOLL AT 0
NO
END OF FILE ?
YES
NO
QAPOLL=
QAPOLL+POLL
OUTPUT
RETURN

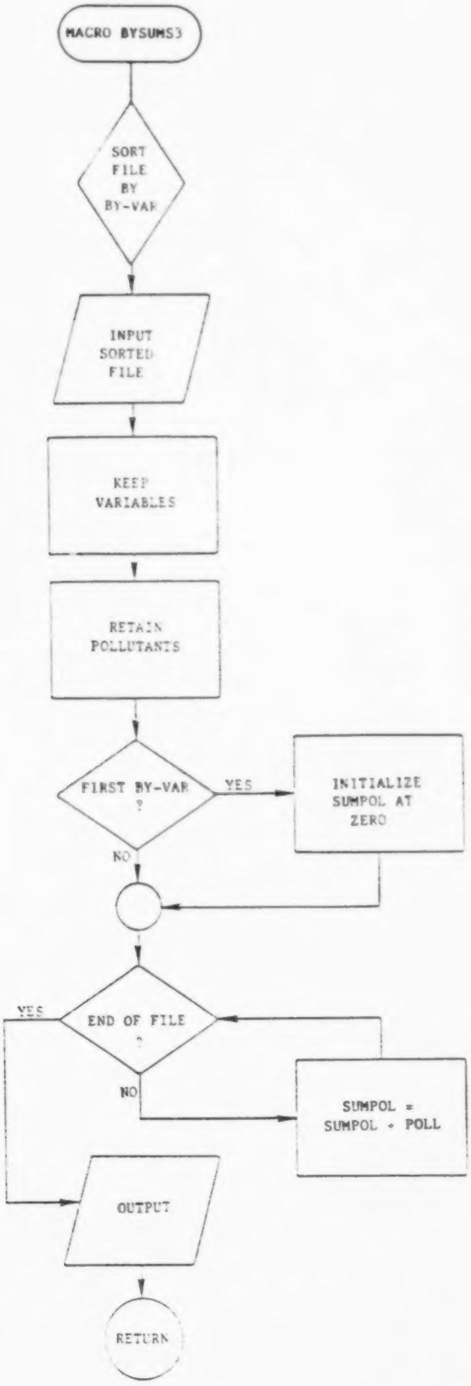

MACRO TOTAL3
INPUT FILE
MACRO KEEPVAR & SOURCE
Macro KEEPVARP or KEEPVARA depending on source.
RETAIN POLLUTANTS
FIRST RECORD?
YES
INITIALIZE SPECIES ARRAY AT ZERO
NO
END OF FILE ?
YES
NO
SPECIES = SPECIES + QASPEC
OUTPUT
RETURN

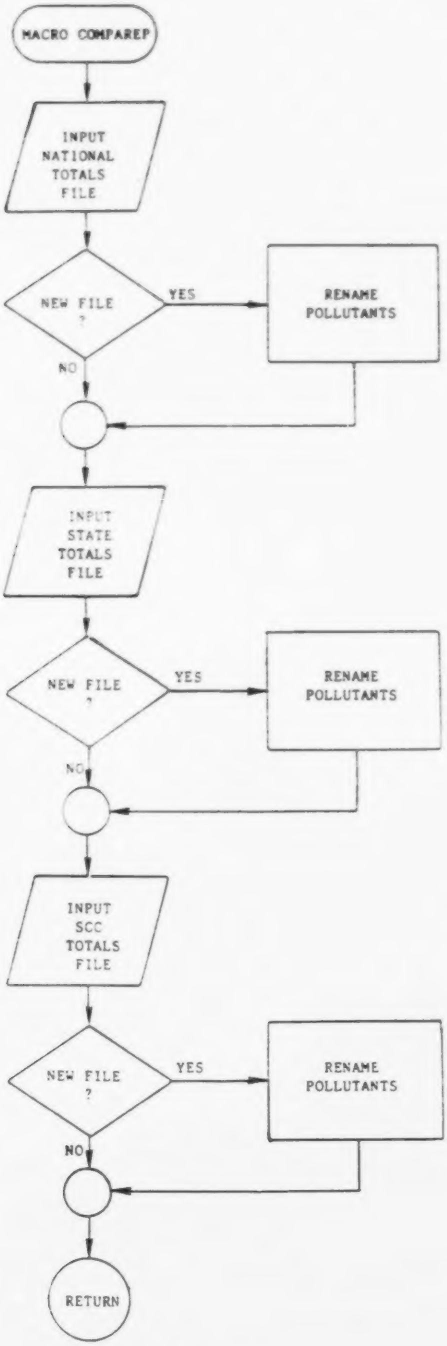

MACRO KEEPVARP
KEEP POINT SOURCE VARIABLES
RETURN

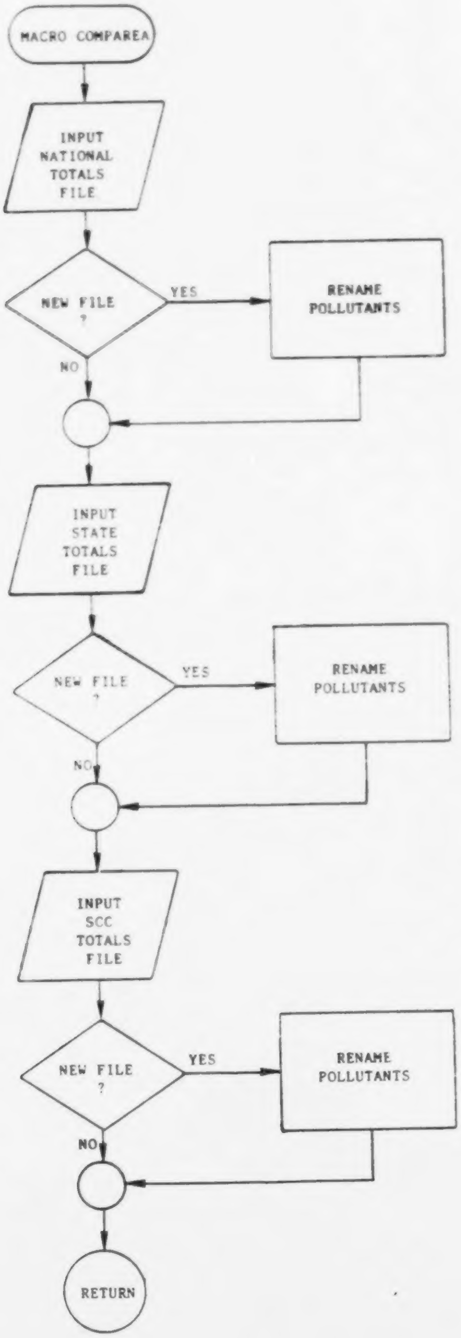

MACRO KEEPVARA
KEEP AREA SOURCE VARIABLES
RETURN

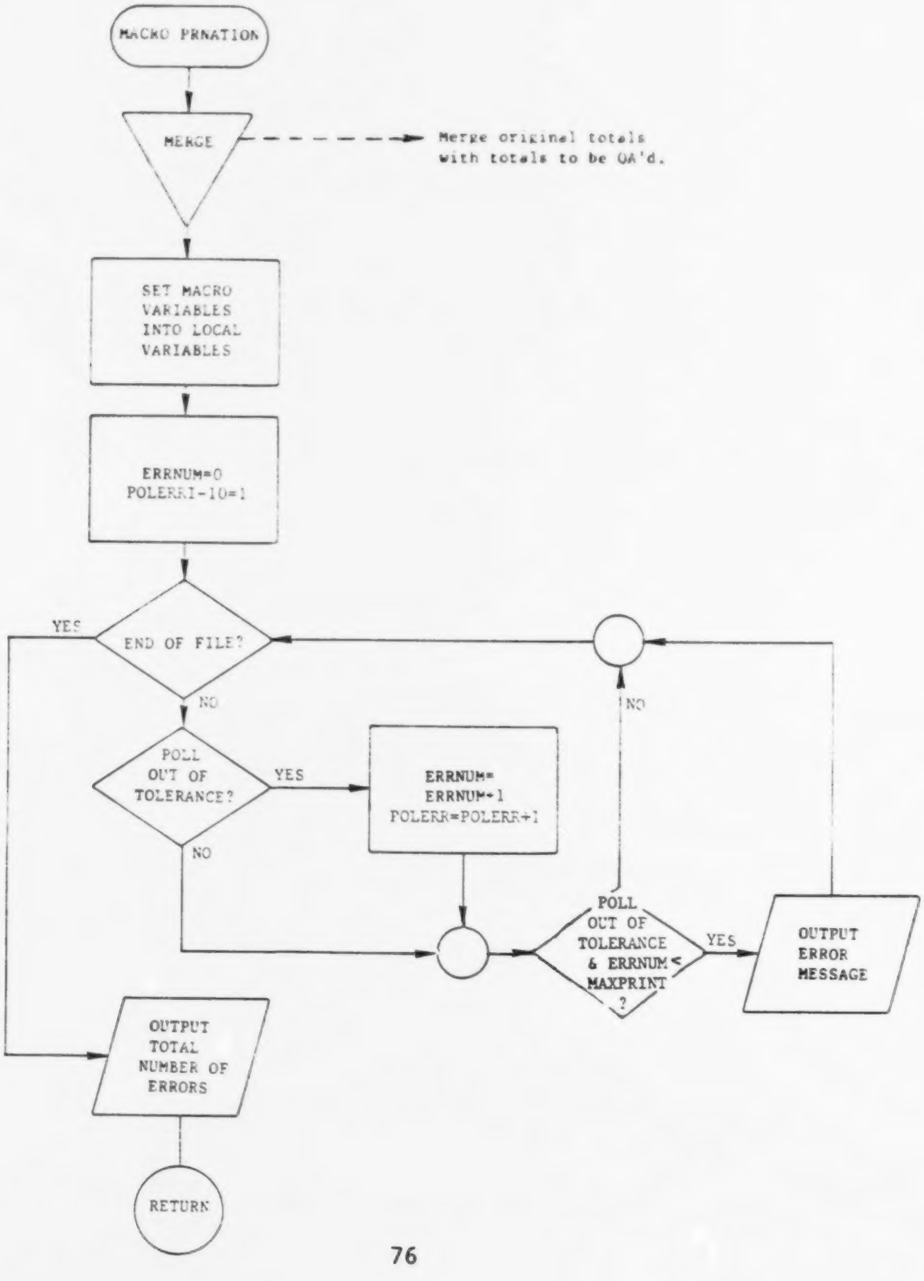

MACRO BYSUMS1
SORT FILE BY BY_VAR
INPUT SORTED FILE
KEEP VARIABLES
RETAIN POLLUTANTS
FIRST BY_VAR?
YES
INITIALIZE SPOLL AT 0
NO
YES
END OF FILE
SPOLL= SPOLL+POLL
NO
OUTPUT
RETURN

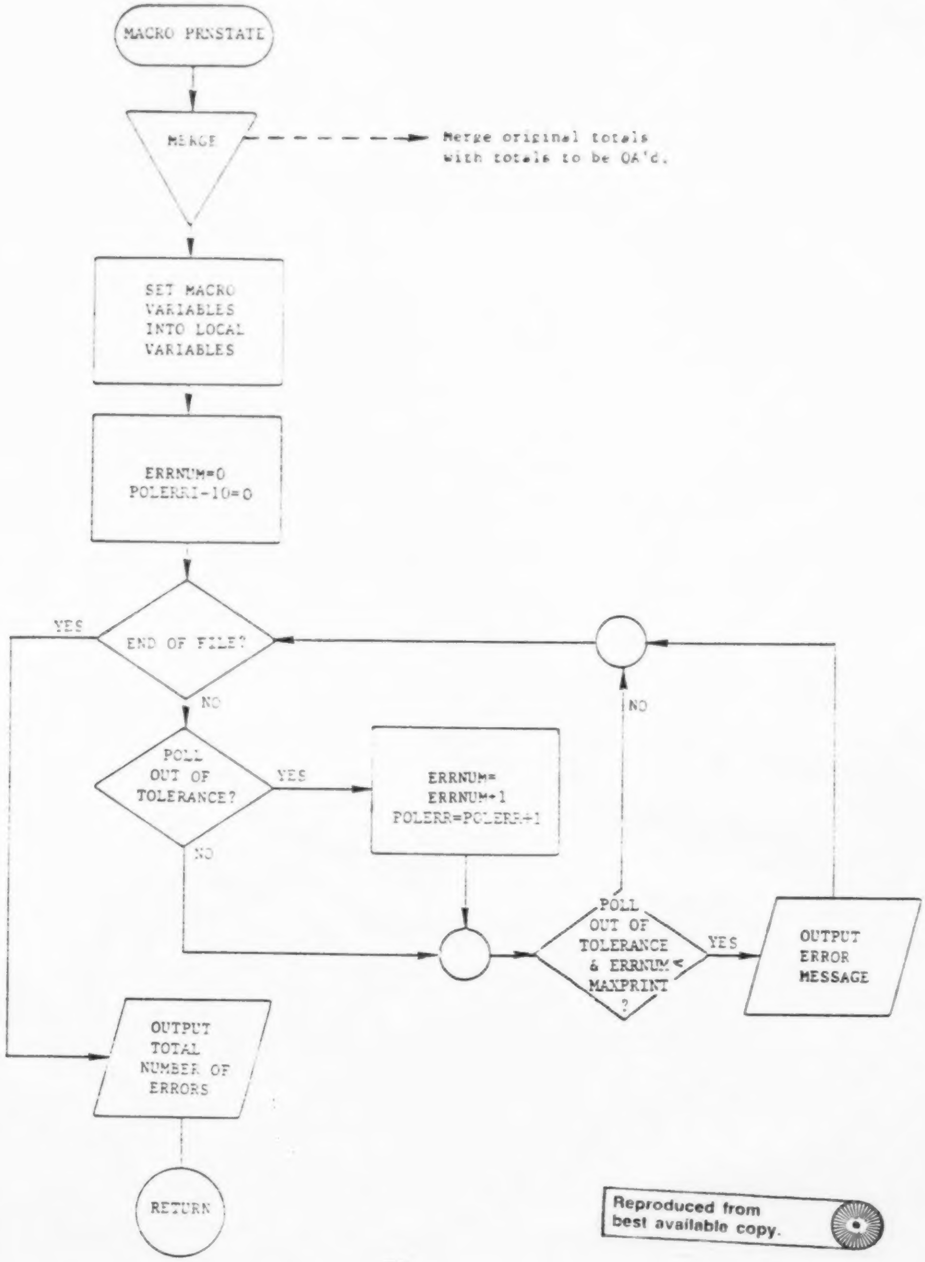

MACRO BYSUMS2
SORT FILE BY BY_VAR
INPUT SORTED FILE
KEEP VARIABLES
RETAIN POLLUTANTS
FIRST BY_VAR?
YES
INITIALIZE OAPOLL AT 0
NO
END OF FILE
YES
OAPOLL= OAPOLL+POLL
NO
OUTPUT
RETURN


MACRO BYSUMS3
SORT FILE BY BY-VAR
INPUT SORTED FILE
KEEP VARIABLES
RETAIN POLLUTANTS
FIRST BY-VAR ?
YES
NO
INITIALIZE SUMPOL AT ZERO
END OF FILE ?
YES
NO
SUMPOL = SUMPOL + POLL
OUTPUT
RETURN

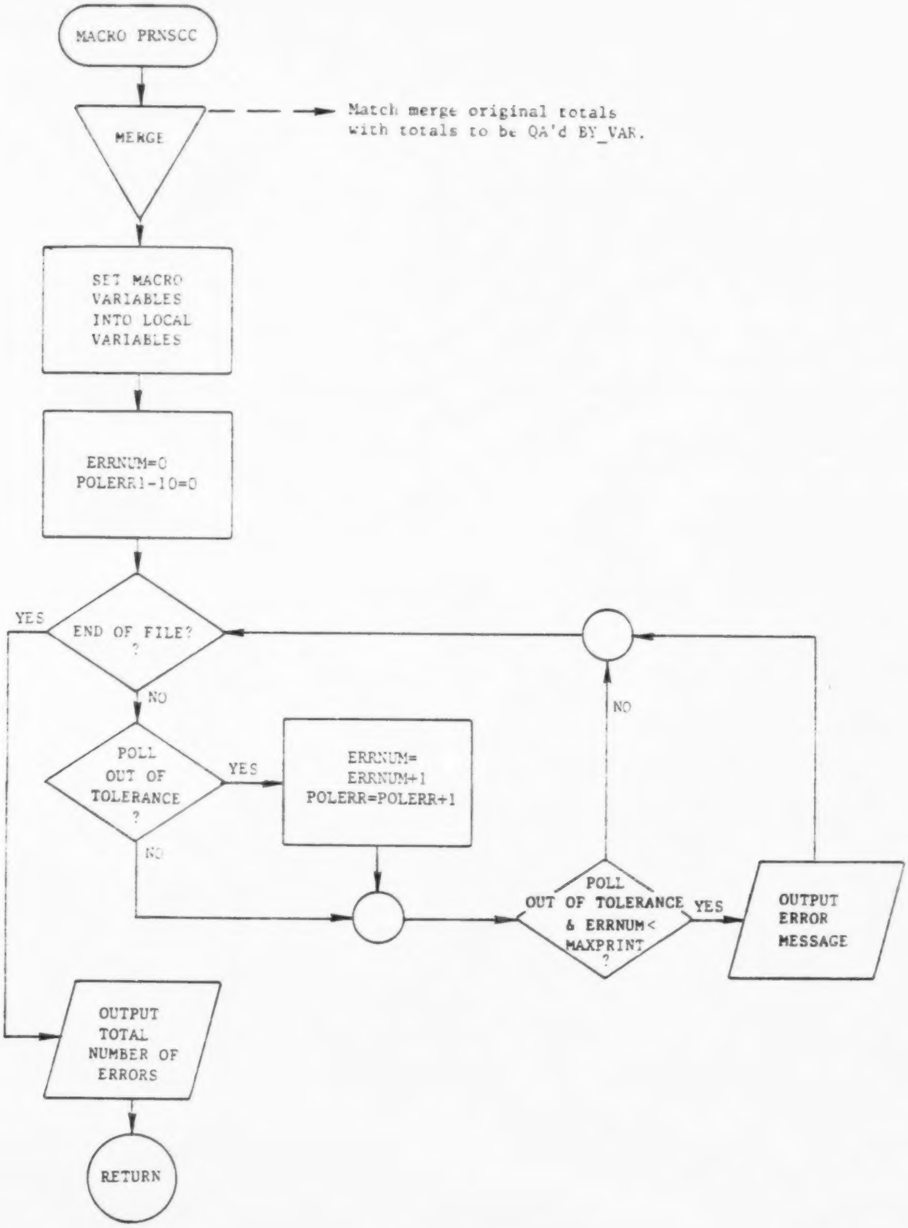

MACRO COMPAREP
INPUT NATIONAL TOTALS FILE
NEW FILE ?
YES
NO
RENAME POLLUTANTS
INPUT STATE TOTALS FILE
NEW FILE ?
YES
NO
RENAME POLLUTANTS
INPUT SCC TOTALS FILE
NEW FILE ?
YES
NO
RENAME POLLUTANTS
RETURN

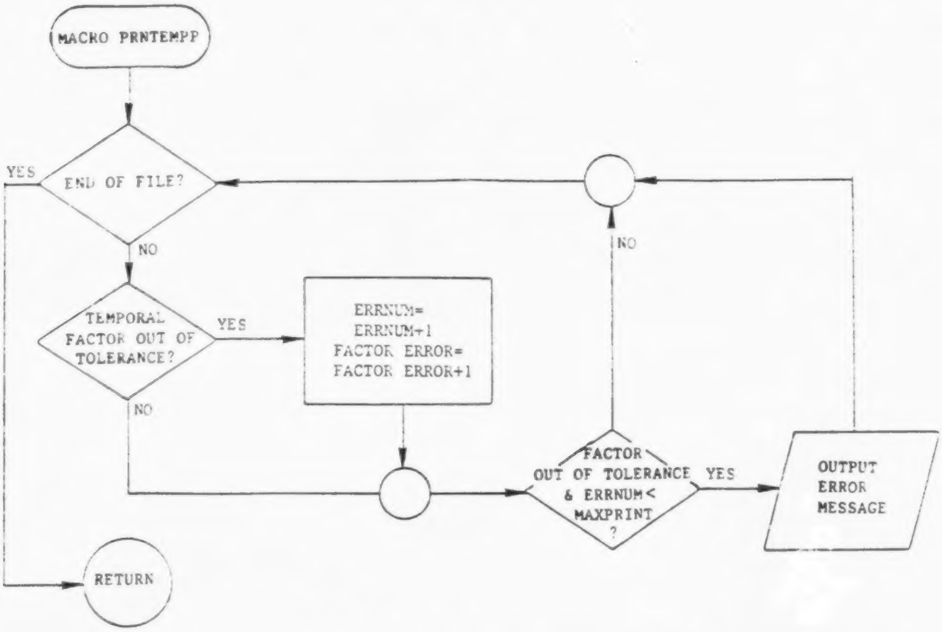

MACRO COMPAREA
INPUT NATIONAL TOTALS FILE
NEW FILE ?
YES
NO
RENAME POLLUTANTS
INPUT STATE TOTALS FILE
NEW FILE ?
YES
NO
RENAME POLLUTANTS
INPUT SCC TOTALS FILE
NEW FILE ?
YES
NO
RENAME POLLUTANTS
RETURN

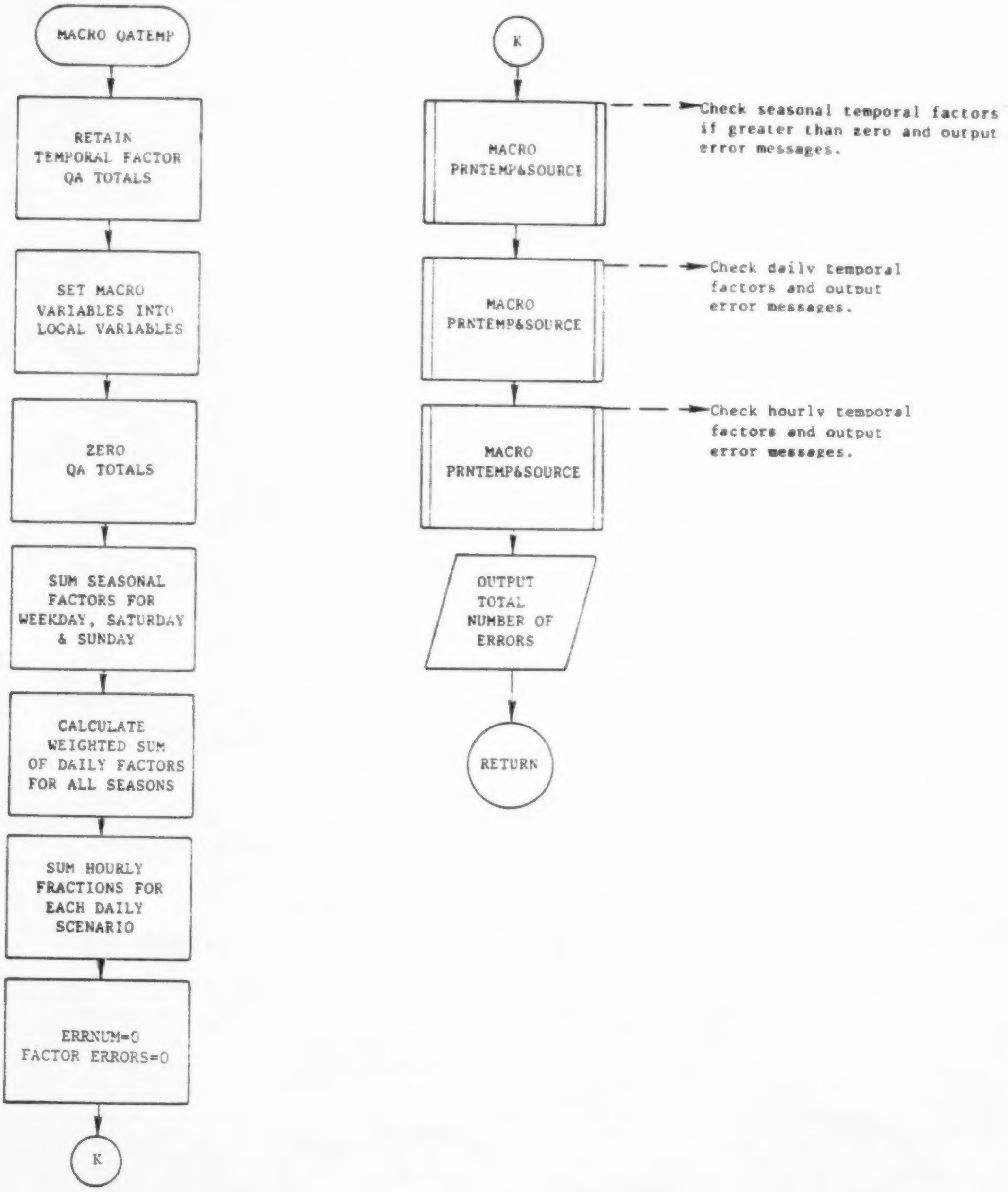

MACRO PRNATION
MERGE
Merge original totals with totals to be QA'd.
SET MACRO VARIABLES INTO LOCAL VARIABLES
ERRNUM=0
POLERRI-10=1
END OF FILE?
YES
NO
POLL OUT OF TOLERANCE?
YES
ERRNUM=ERRNUM+1
POLERR=POLERR+1
NO
POLL OUT OF TOLERANCE & ERRNUM ≤ MAXPRINT ?
YES
NO
OUTPUT ERROR MESSAGE
OUTPUT TOTAL NUMBER OF ERRORS
RETURN

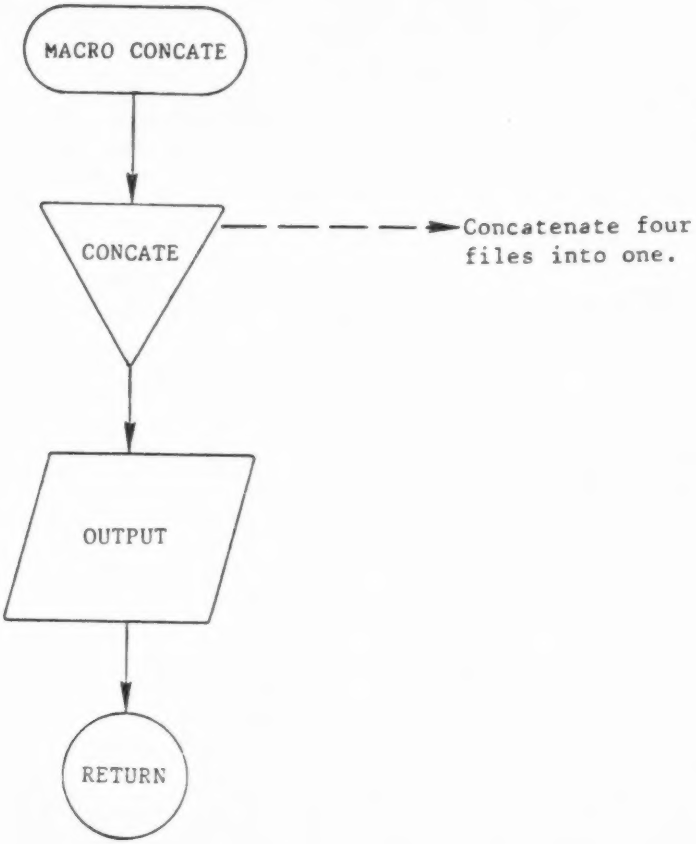

MACRO PRXSTATE
MERGE
Merge original totals with totals to be QA'd.
SET MACRO VARIABLES INTO LOCAL VARIABLES
ERRNUM=0
POLERR1-10=0
END OF FILE?
YES
NO
POLL OUT OF TOLERANCE?
YES
NO
ERRNUM= ERRNUM+1
POLERR=POLERR+1
POLL OUT OF TOLERANCE & ERRNUM < MAXPRINT ?
YES
NO
OUTPUT ERROR MESSAGE
OUTPUT TOTAL NUMBER OF ERRORS
RETURN

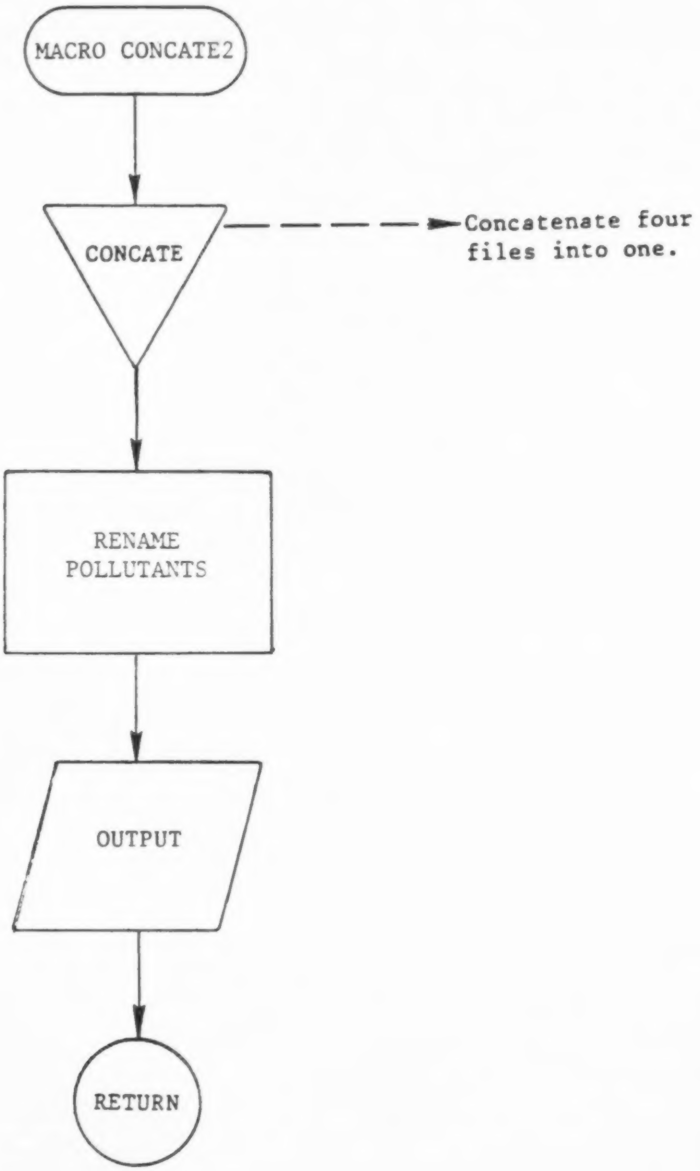
Reproduced from best available copy.

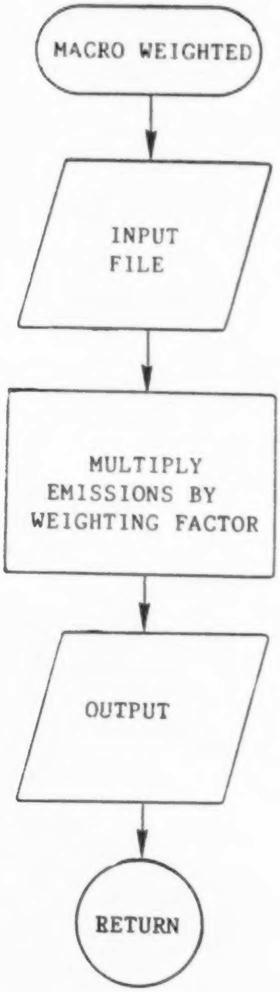

MACRO PRNSCC
MERGE
Match merge original totals with totals to be QA'd BY_VAR.
SET MACRO VARIABLES INTO LOCAL VARIABLES
ERRNUM=0
POLERR1-10=0
YES
END OF FILE? ?
NO
POLL OUT OF TOLERANCE ?
YES
ERRNUM= ERRNUM+1
POLERR=POLERR+1
NO
NO
POLL OUT OF TOLERANCE & ERRNUM< MAXPRINT ?
YES
OUTPUT ERROR MESSAGE
OUTPUT TOTAL NUMBER OF ERRORS
RETURN


MACRO PRNTEMPP
END OF FILE?
YES
NO
TEMPORAL FACTOR OUT OF TOLERANCE?
YES
NO
ERRNUM= ERRNUM+1 FACTOR ERROR= FACTOR ERROR+1
FACTOR OUT OF TOLERANCE & ERRNUM< MAXPRINT ?
YES
NO
OUTPUT ERROR MESSAGE
RETURN


MACRO QATEMP
RETAIN TEMPORAL FACTOR QA TOTALS
SET MACRO VARIABLES INTO LOCAL VARIABLES
ZERO QA TOTALS
SUM SEASONAL FACTORS FOR WEEKDAY, SATURDAY & SUNDAY
CALCULATE WEIGHTED SUM OF DAILY FACTORS FOR ALL SEASONS
SUM HOURLY FRACTIONS FOR EACH DAILY SCENARIO
ERRNUM=0 FACTOR ERRORS=0
K
K
MACRO PRNTEMP&SOURCE
Check seasonal temporal factors if greater than zero and output error messages.
MACRO PRNTEMP&SOURCE
Check daily temporal factors and output error messages.
MACRO PRNTEMP&SOURCE
Check hourly temporal factors and output error messages.
OUTPUT TOTAL NUMBER OF ERRORS
RETURN


MACRO CONCATE
CONCATE
Concatenate four files into one.
OUTPUT
RETURN


MACRO CONCATE2
CONCATE
Concatenate four files into one.
RENAME POLLUTANTS
OUTPUT
RETURN


MACRO WEIGHTED
INPUT FILE
MULTIPLY EMISSIONS BY WEIGHTING FACTOR
OUTPUT
RETURN

MODEL DATA EXTRACTION MODULE

FREDS interfaces with the NAPAP preprocessed annual emissions files via the Model Data Extraction Module (MDEM). MDEM will accept SAS-formatted point or area source emissions files, and is the primary interface between the NAPAP annual pollutant master files and the allocation modules. Point source data input to MDEM are derived from SCC-level NEDS subfile records from each state. These data are preprocessed into SAS data sets by a program which performs a series of data checks, sorts the data, and creates a SAS file. Documentation of this procedure is found in "Development of the 1985 NAPAP Emissions Inventory"[2]. Area source emissions data consist of NEDS data preprocessed into a SAS file. Prior to MDEM, point and area source data are processed through the Hydrocarbon Preprocessor to ensure consistency between U.S. and Canadian hydrocarbon data.

The primary function of MDEM is to reduce the volume of emissions data to be processed and to create pollutant- and industry-specific emissions data subfiles. MDEM condenses point source data for each emissions point and area source records for each area source category at the county level. File size is minimized by dropping variables not referenced by FREDS. If specified by the user, MDEM will separate "major" point sources from "minor" point sources, and will segment the reduced emissions records into logical groups, defined by pollutant or industry, for their subsequent independent processing through the rest of FREDS. In addition, annual area source pollutants represented by the variables SAROAD1-15 and EMISS1-15 (where SAROAD1-15 are the pollutant SAROAD codes for user defined pollutants and EMISS1-15 are the emissions corresponding to the SAROAD codes) are extracted and placed into a total of 15 variables. For example, the pollutant SAROAD code corresponding to TSP (11101) may be found in SAROAD3 and corresponding emissions in EMISS3. MDEM will extract this information, create a variable ATSP, and place the value of EMISS3 in ATSP. This allows the pollutant definition and emissions to be contained in one variable. For point sources, the arrays SAROAD1-15 and EMISS1-15 are maintained.

MDEM requires the following input files:

- SAS-Formatted Point Source Emissions File
- SAS-Formatted Area Source Emissions File
- Control Options File (COF)

MDEM output includes a diagnostic report providing a record of execution, warning and error messages, a summary of the actions performed (e.g., point or area source records processed, industry subfiles created, zero emissions records deleted, etc.) and general accounting information. A hard-copy listing of the first 50 point or area source emissions records is also available. For area sources, MDEM also outputs annual emissions totals when requested by the user.

The primary products of MDEM are the following condensed emissions data files and subfiles:

- Point source emissions file
- Major point source subfiles
- Minor point source subfiles
- Area source emissions file
- Area source THC/NO_x emissions file
- Area source TSP/SO_2 emissions file
- Point source industry subfiles
- Area source industry subfiles

Extraction of Modeling Parameters

MDEM accepts either point or area source input files, which requires that the appropriate MDEM SAS code for the source type is selected. Once the user-defined emissions data are input, MDEM extracts from each emissions record the essential parameters needed to identify each emissions point or county level area source category. The condensed point and area source emission records are sorted by SCC, State and County. Point source records are further sorted by Plant ID and Point ID.

Creation of Major and Minor Point Source Files--

It is anticipated that some modeling applications will require different treatment of major and minor point sources. If requested, MDEM will separate emissions data for point sources into major and minor point source subfiles, based on user specified emission limits, for their independent processing through the remainder of FREDS.

The Control Options File provides the major/minor point source selection criteria. The user must enter the pollutant(s) used to distinguish major sources from minor sources, referenced by SAROAD codes, and the appropriate emissions cutoff level (tons/yr) for each. An emission point will be considered "major" if any of the user selected pollutant thresholds are exceeded. Annual point source pollutants are then extracted and may be output to major or minor point source subfiles.

Creation of Pollutant and Industry Subfiles--

It is also anticipated that some modeling applications will involve the evaluation of various emissions control and growth scenarios. Generally, control and growth (projection) factors are defined by industry group. Based on a user-designated set of SIC/SCC combinations, MDEM will separate emissions data into industry groups, for both point and area sources. These groups correspond to those for which control options and/or growth scenarios are to be evaluated for a particular study. This allows the optional evaluation of various projection scenarios by applying industry-specific control and/or growth factors to the gridded, speciated and temporally resolved data, thus eliminating the need to reprocess the "projected" inventory through the entire system.

The Control Options File and corresponding MDEM code enable the user to specify whether industry subfiles will be created for major and minor point sources or for area sources. The user designates the number of subfiles to be created and the definition (in terms of SIC/SCC) of each. Records that do not meet the SIC/SCC criteria are output to a miscellaneous subfile.

Before the area source data are output to the miscellaneous subfile, two additional pollutant subfiles are created: one containing THC, VOC, and NO_x, and the other containing the remaining area source pollutants. The file split reduces the data processing burden posed by the large area source file, and also allows separate FREDS runs to proceed independently (for differing particulate control strategies or differing hydrocarbon speciation), without rerunning the entire inventory. These two files will be referred to in this document as the "THC/NO_x" file and the "TSP/SO_2" file, respectively.

Flow Chart and Description

Detailed descriptions of both the point and area source versions of MDEM are illustrated in the accompanying flow charts. An individual "set" of flow charts is presented for point and area sources. The first diagram of each set represents the overall module flow. Processes depicted by double vertical lines indicate the presence of several subprocesses, and hence a second level of more detailed diagrams is presented for these. For example, the first double-lined process is "READ CONTROL OPTIONS FILE." Starting on the next page, the reader will find a second-level chart with the same name. Double-lined processes here refer to third level subprocesses. On completion of the third level of subprocesses, the user returns to the second level, and then back to the first. The user would then continue on the first level until the next double-lined process is encountered - "MACRO EMISIN". Again, the reader refers to a second level diagram. This continues until the reader has encountered all processes depicted on the main module flow chart.

The first step performed by MDEM when processing both point and area sources is to read and validate the Control Options File (COF). Each record of the COF is first checked for identification. Based on control record type, the proper input routine is called to read the data, assign values to appropriate variables, increment variable and record counters, and check the data for validity. When the end of the control file is encountered, the COF has been reformatted as a SAS file containing control processing parameters.

Once the Control Options File has been processed, macro variables used for SIC/SCC and major/minor subfile definitions (INDX2, INDX3, and MINOR) and, for area sources, annual pollutant variable names (e.g., ASO_2, ASO_4) are created from the control file variables in the main body of the program. The main program next calls a processing macro, SETUP, to create global macro variables for definition of SIC/SCC or major/minor subfiles (SUBDD1-SUBDD50) and to invoke the EMISIN and SORTEM macros. The macro EMISIN reads the corresponding emissions file. For SAS files, the input is simplified from the 1980 version since MDEM is not required to loop over the EIS record structure. Emission records are output in SAS format while unnecessary data are dropped from the data sets. The SORTEM macro is then called to sort the condensed emissions file by SCC, state, and county for area sources and by SCC, state, county, Plant ID and Point ID, for point sources. At this point, MDEM classifies emissions as follows.

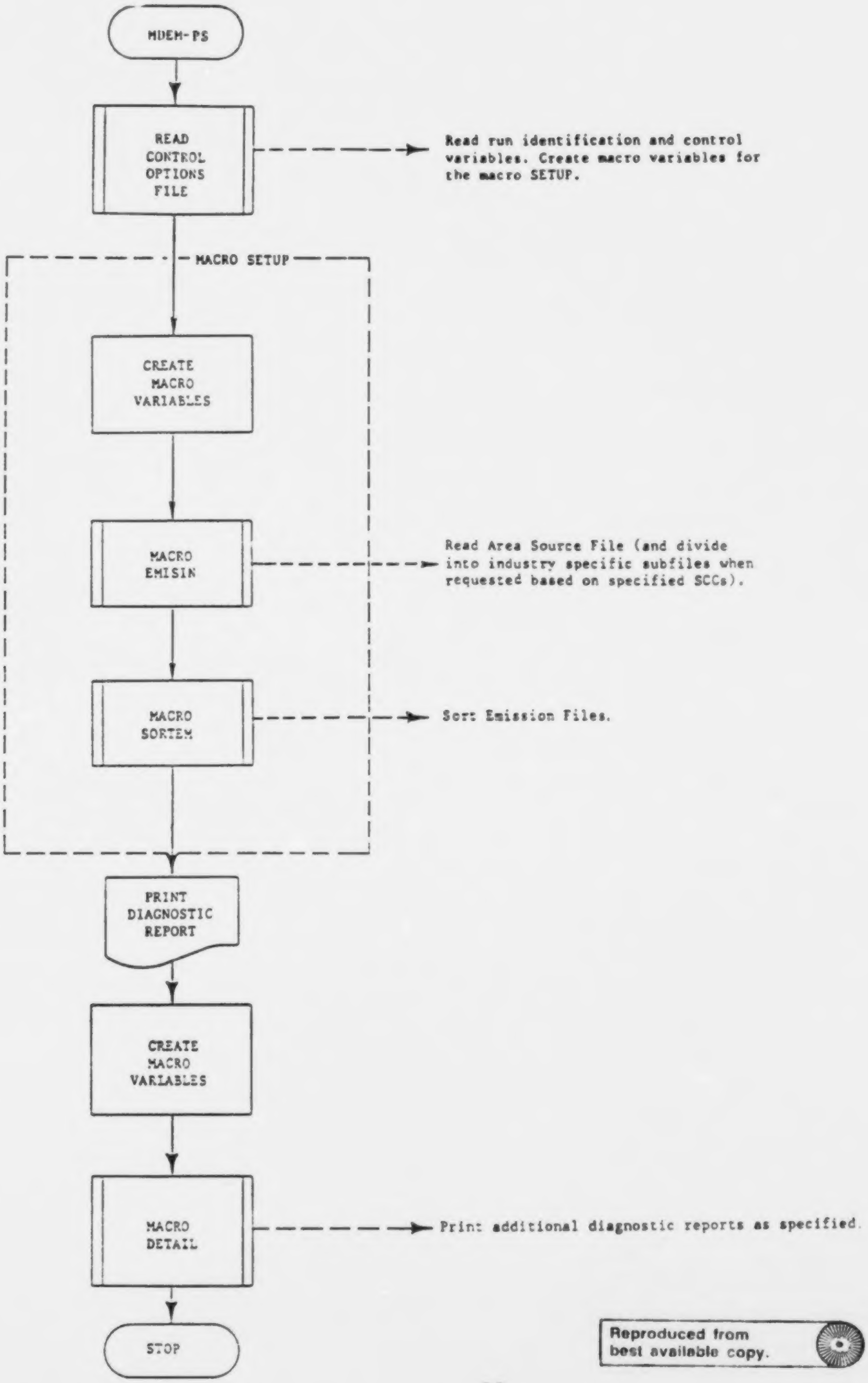
For point sources, the pollutant SAROAD codes and corresponding emissions are retained in their original format. Annual emissions are checked against major/minor limits specified in the COF. If any limits are exceeded, the source record is considered a major point source. If no limits are exceeded, the record is classified as a minor point source. MDEM then checks the list of SIC/SCC combinations specified in the COF. If a match is found, the source emissions record is output to either the major or minor point source file for that SIC/SCC combination. If no match is found, the record is output to the major or minor miscellaneous file.

Area sources are not separated into major and minor categories, therefore the MDEM only checks for SCC defined subfiles. The subroutine EMISIN inputs the emissions file and divides it into SCC specific subfiles based on the control options specified. Matches are output to the corresponding SCC file while nonmatched records are added to the miscellaneous file. In addition, EMISIN extracts annual emissions from SAROAD1-15 and EMISS1-15 and places emissions into 15 pollutant variables, where SAROAD1-15 are the pollutant SAROAD codes for user defined pollutants, and EMISS1-15 are the emissions corresponding to the SAROAD codes. For example, the pollutant SAROAD code corresponding to SO_2 (42401) may be found in SAROAD1 and corresponding emissions in EMISS1. MDEM will extract this information, create a variable ASO_2 and place the value of EMISS1 in ASO_2, allowing the pollutant definition and emissions to be contained in one variable. These emissions are then output to an appropriate file or subfile.

Before the data are output, MDEM searches for and deletes all records containing a total of zero emissions in both the point and area source files. The elimination of these unnecessary records can result in substantial savings throughout subsequent processing. Additionally, the area source file is divided into two smaller files, one containing THC, VOC, and NO_x, and the other containing the remaining area source pollutants. MDEM again searches for and deletes all records containing a total of zero emissions in each file after the split. Macro variable counters individually track the number of zero emissions records deleted in each file. The totals stored in these counters are included in the diagnostic report.

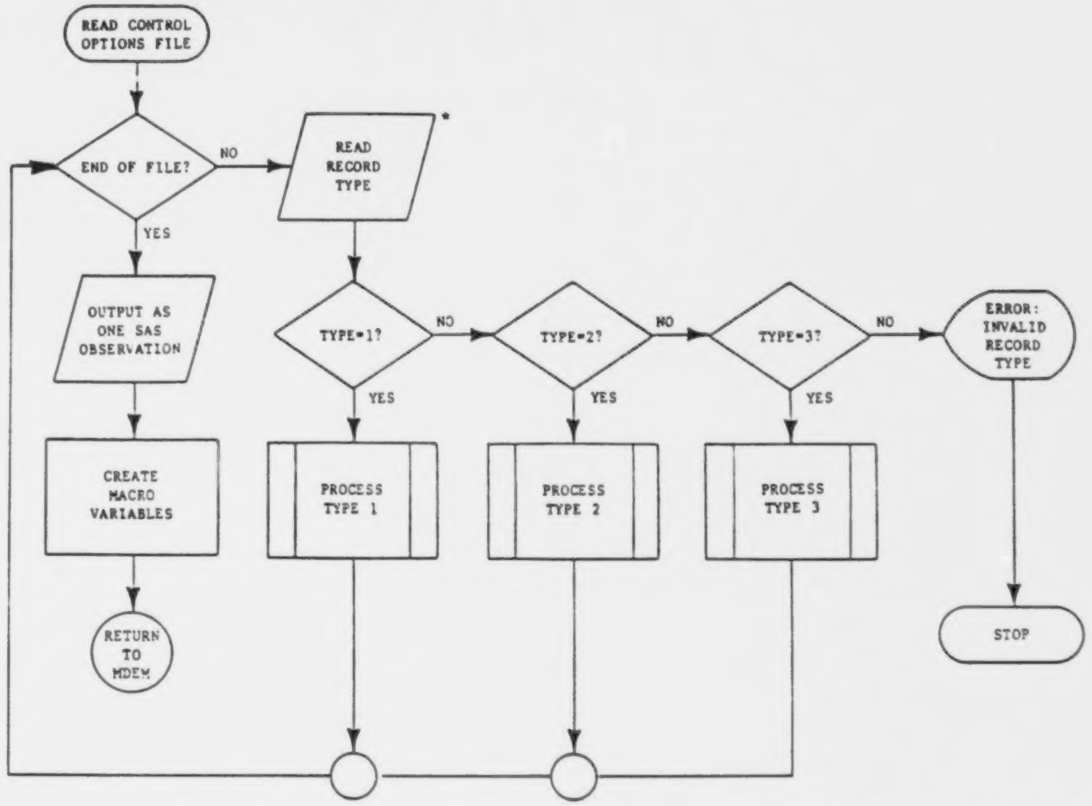
When all of the emissions records have been successfully processed, the SAS Print procedure is invoked by MDEM to provide the diagnostic report for point and area sources. The level of detail of the report is determined by the user in the COF. For a summary report, the control options, the counters for each file or subfile created, the counters for the number of zero emissions records deleted, and the number of records in the input emissions file are listed along with appropriate diagnostic messages. The detailed report contains all aspects of the summary report and a listing of source identification information for each emissions record for each file or subfile. Emissions totals may also be requested for the annual area source pollutants.

Model Data Extraction Module: Point Sources--


MDEM-PS
READ CONTROL OPTIONS FILE
Read run identification and control variables. Create macro variables for the macro SETUP.
MACRO SETUP
CREATE MACRO VARIABLES
MACRO EMISIN
Read Area Source File (and divide into industry specific subfiles when requested based on specified SCCs).
MACRO SORTEM
Sort Emission Files.
PRINT DIAGNOSTIC REPORT
CREATE MACRO VARIABLES
MACRO DETAIL
Print additional diagnostic reports as specified.
STOP

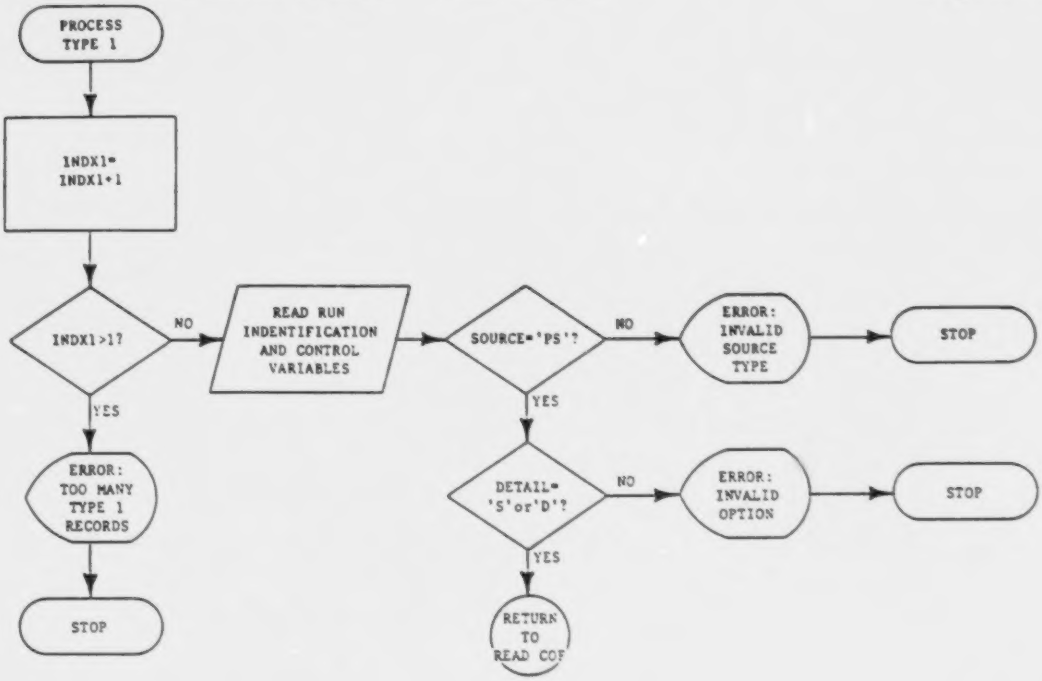
Reproduced from best available copy.

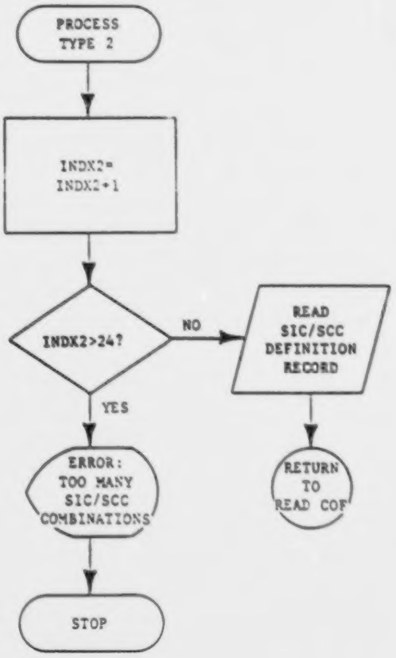
Model Data Extraction Module: Point Sources-- Page 2 of 11

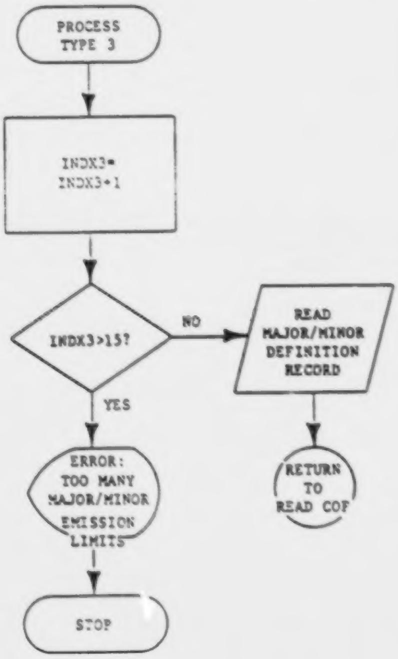

READ CONTROL OPTIONS FILE
END OF FILE?
NO
YES
READ RECORD TYPE
*
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABLES
RETURN TO MDEM
TYPE=1?
NO
YES
TYPE=2?
NO
YES
TYPE=3?
NO
YES
ERROR: INVALID RECORD TYPE
PROCESS TYPE 1
PROCESS TYPE 2
PROCESS TYPE 3
STOP

*DO NOT ADVANCE RECORD POINTER

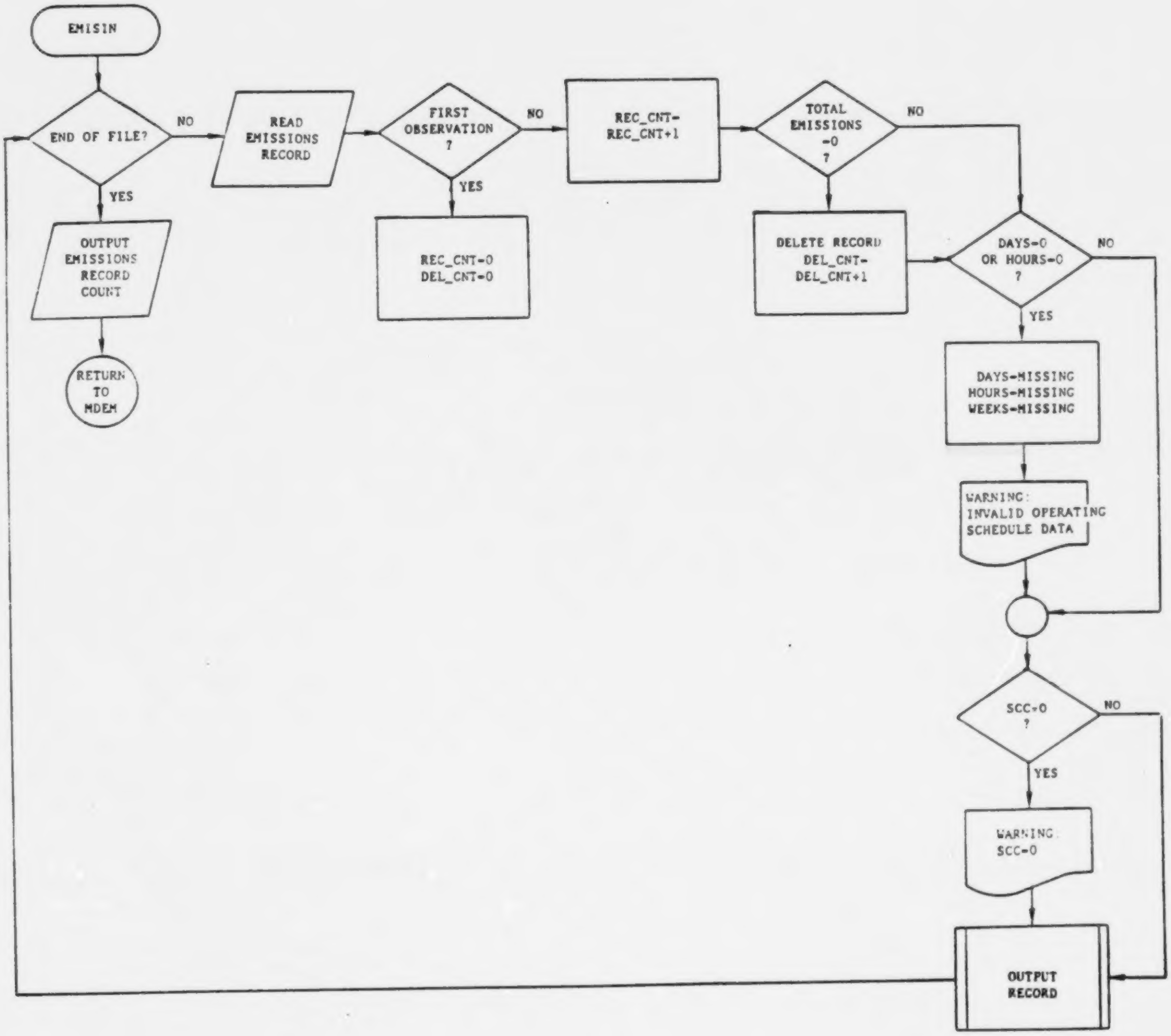
Model Data Extraction Module: Point Sources-- Page 3 of 11


PROCESS TYPE 1
INDX1= INDX1+1
INDX1>1?
NO
YES
READ RUN INDENTIFICATION AND CONTROL VARIABLES
SOURCE='PS'?
NO
YES
ERROR: INVALID SOURCE TYPE
STOP
DETAIL= 'S'or'D'?
NO
YES
ERROR: INVALID OPTION
STOP
RETURN TO READ COF
ERROR: TOO MANY TYPE 1 RECORDS
STOP

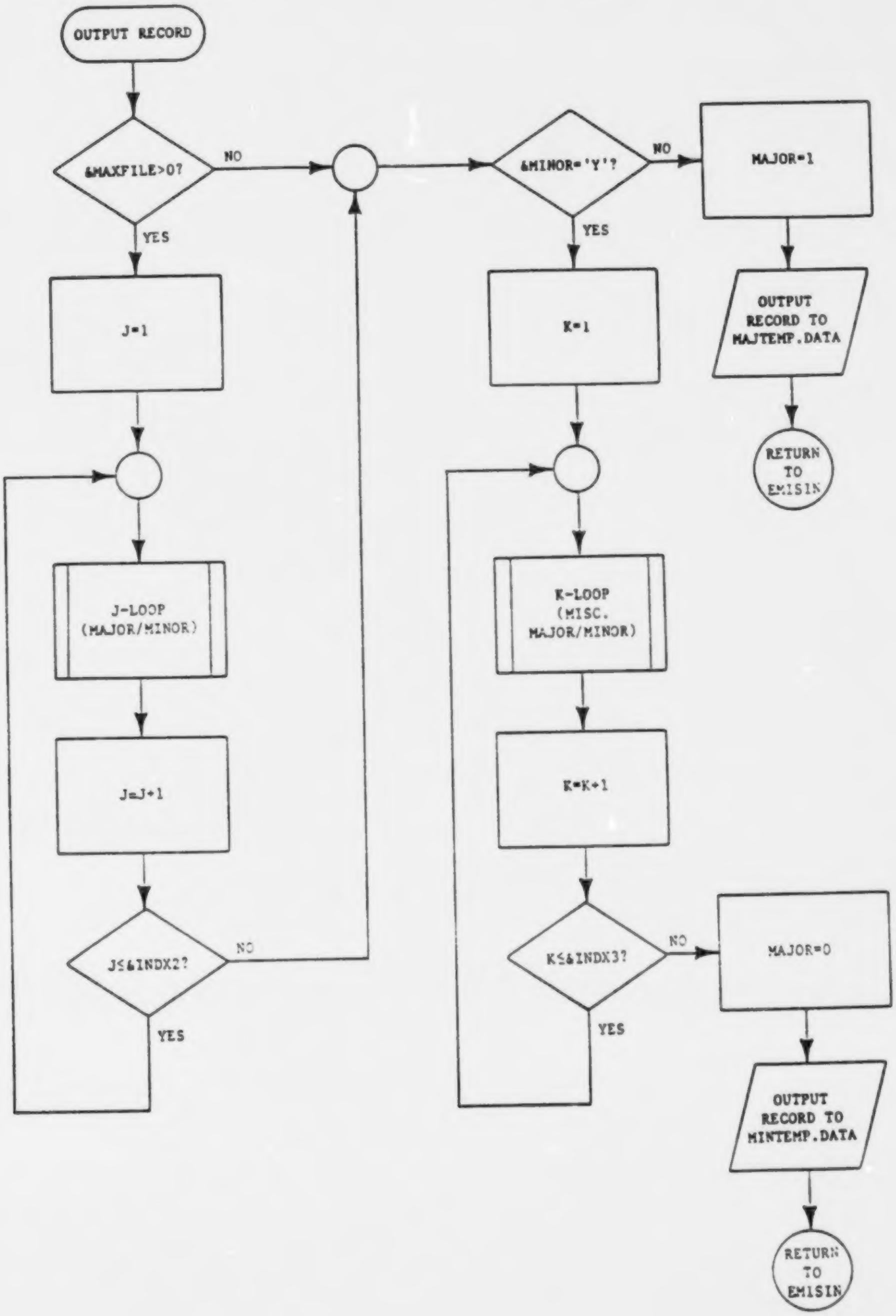

PROCESS TYPE 2
INDX2= INDX2+1
INDX2>24?
NO
YES
READ SIC/SCC DEFINITION RECORD
RETURN TO READ COF
ERROR: TOO MANY SIC/SCC COMBINATIONS
STOP


PROCESS TYPE 3
INDX3= INDX3+1
INDX3>15?
NO
YES
READ MAJOR/MINOR DEFINITION RECORD
RETURN TO READ COF
ERROR: TOO MANY MAJOR/MINOR EMISSION LIMITS
STOP

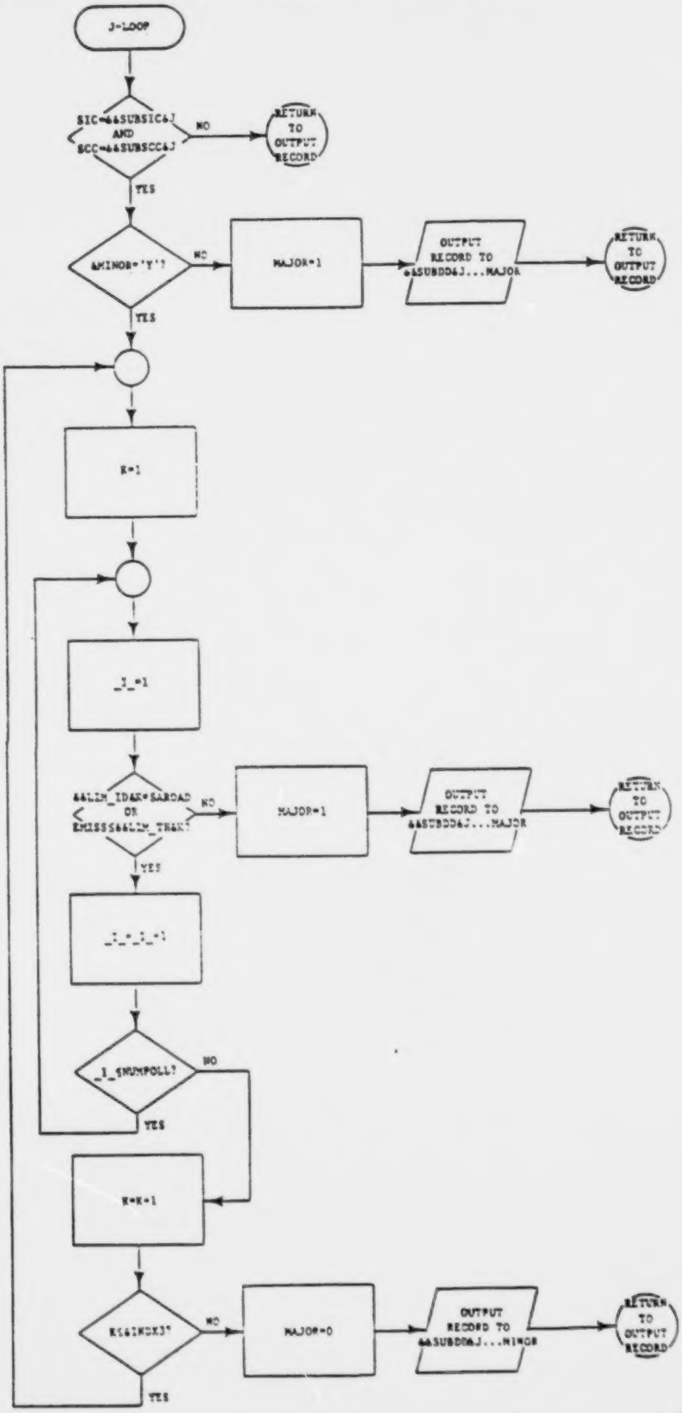
Model Data Extraction Module: Point Sources-- Page 4 of 11


EMISIN
END OF FILE?
NO
YES
READ EMISSIONS RECORD
FIRST OBSERVATION ?
NO
YES
REC_CNT=0 DEL_CNT=0
REC_CNT= REC_CNT+1
TOTAL EMISSIONS =0 ?
NO
DELETE RECORD DEL_CNT= DEL_CNT+1
DAYS=0 OR HOURS=0 ?
NO
YES
DAYS=MISSING HOURS=MISSING WEEKS=MISSING
WARNING: INVALID OPERATING SCHEDULE DATA
SCC=0 ?
NO
YES
WARNING: SCC=0
OUTPUT RECORD
OUTPUT EMISSIONS RECORD COUNT
RETURN TO MDEM

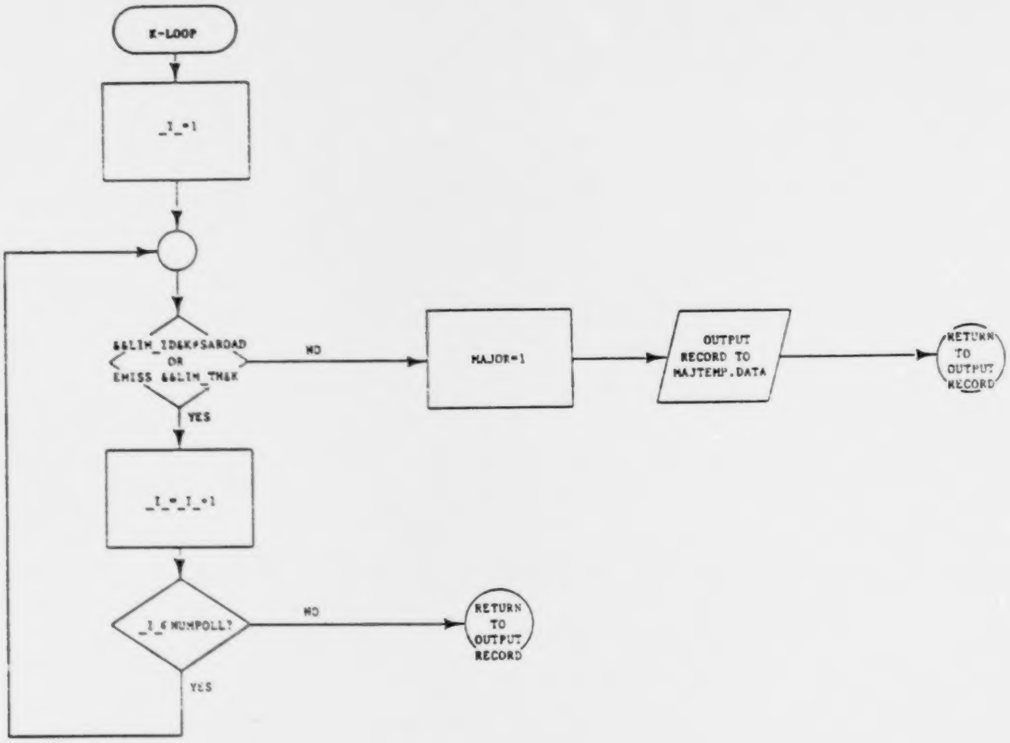
Model Data Extraction Module: Point Sources-- Page 5 of 11


OUTPUT RECORD
&MAXFILE>0?
NO
YES
J=1
J-LOOP (MAJOR/MINOR)
J=J+1
J≤&INDX2?
NO
YES
&MINOR='Y'?
NO
YES
MAJOR=1
OUTPUT RECORD TO MAJTEMP.DATA
RETURN TO EMISIN
K=1
K-LOOP (MISC. MAJOR/MINOR)
K=K+1
K≤&INDX3?
NO
YES
MAJOR=0
OUTPUT RECORD TO MINTEMP.DATA
RETURN TO EMISIN

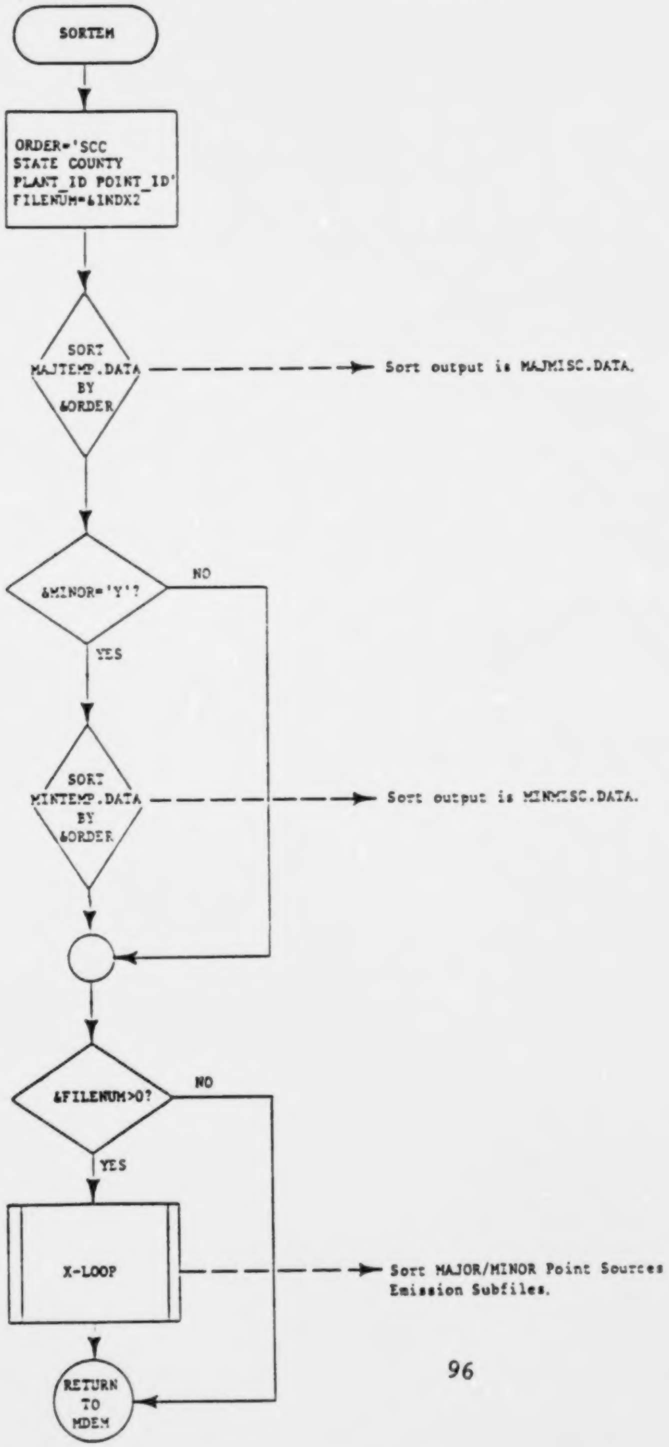
Model Data Extraction Module: Point Sources-- Page 6 of 11


J-LOOP
SIC=&&SUBSIC&J AND SCC=&&SUBSCC&J
NO
RETURN TO OUTPUT RECORD
YES
&MINOR='Y'?
NO
MAJOR=1
OUTPUT RECORD TO &&SUBDD&J...MAJOR
RETURN TO OUTPUT RECORD
YES
K=1
_I_=1
&&LIM_ID&K=SAROAD OR EMISS$&&LIM_TH&K?
NO
MAJOR=1
OUTPUT RECORD TO &&SUBDD&J...MAJOR
RETURN TO OUTPUT RECORD
YES
_I_=_I_+1
_I_$NUMPOLL?
NO
YES
K=K+1
K$&INDX3?
NO
MAJOR=0
OUTPUT RECORD TO &&SUBDD&J...MINOR
RETURN TO OUTPUT RECORD
YES

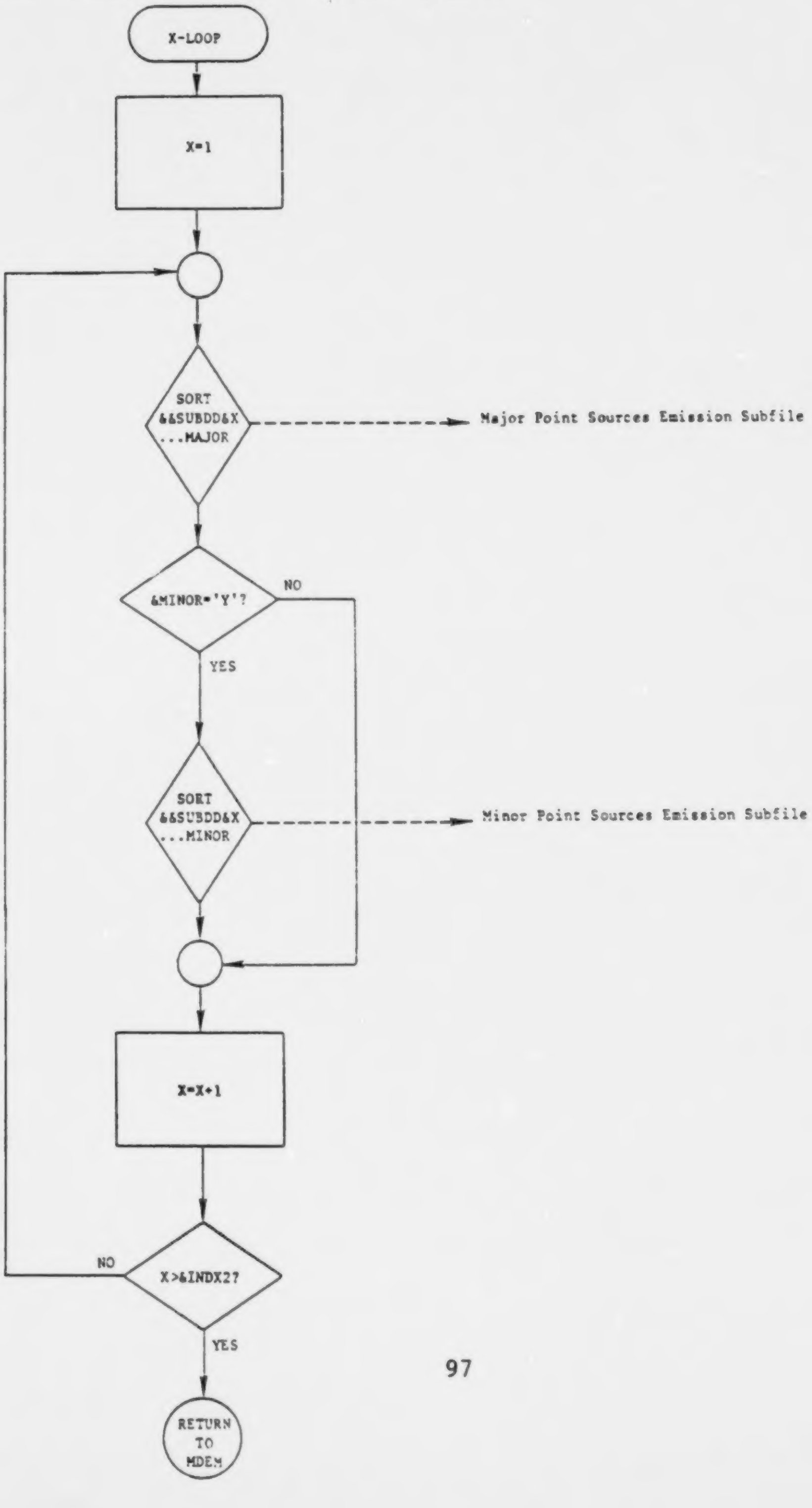
Reproduced from best available copy.

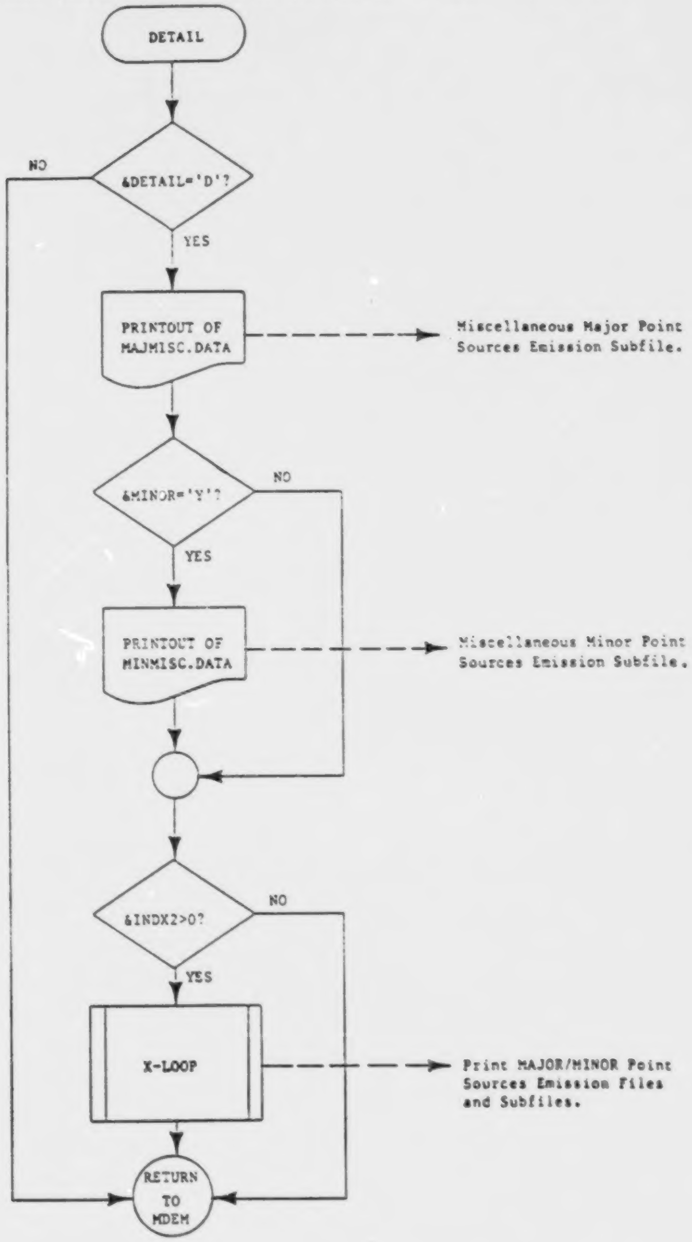

K-LOOP
_I_=1
&&LIM_ID&K≠SAROAD
OR
EMISS &&LIM_TH&K
NO
YES
MAJOR=1
OUTPUT RECORD TO MAJTEMP.DATA
RETURN TO OUTPUT RECORD
_I_=_I_+1
_I_≤NUMPOLL?
NO
YES
RETURN TO OUTPUT RECORD

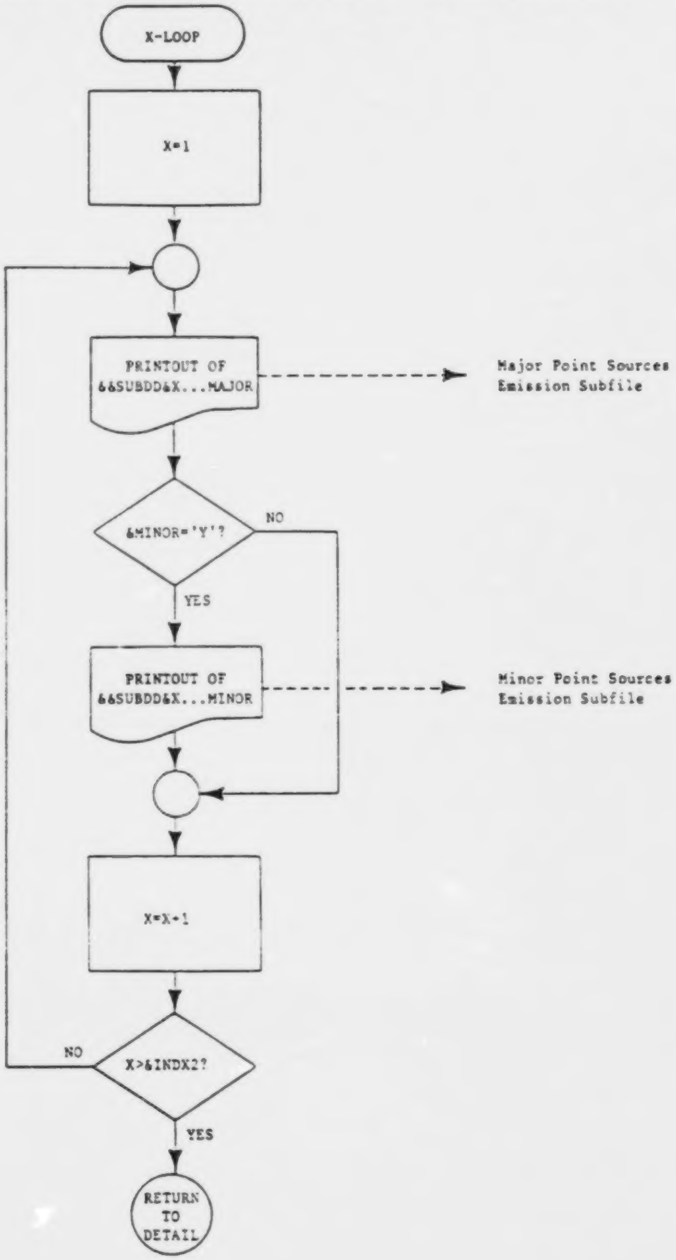
Model Data Extraction Module: Point Sources-- Page 8 of 11


SORTEM
ORDER='SCC
STATE COUNTY
PLANT_ID POINT_ID'
FILENUM=&INDX2
SORT
MAJTEMP.DATA
BY
&ORDER
Sort output is MAJMISC.DATA.
&MINOR='Y'?
NO
YES
SORT
MINTEMP.DATA
BY
&ORDER
Sort output is MINMISC.DATA.
&FILENUM>0?
NO
YES
X-LOOP
Sort MAJOR/MINOR Point Sources
Emission Subfiles.
RETURN
TO
MDEM

Model Data Extraction Module: Point Sources-- Page 9 of 11

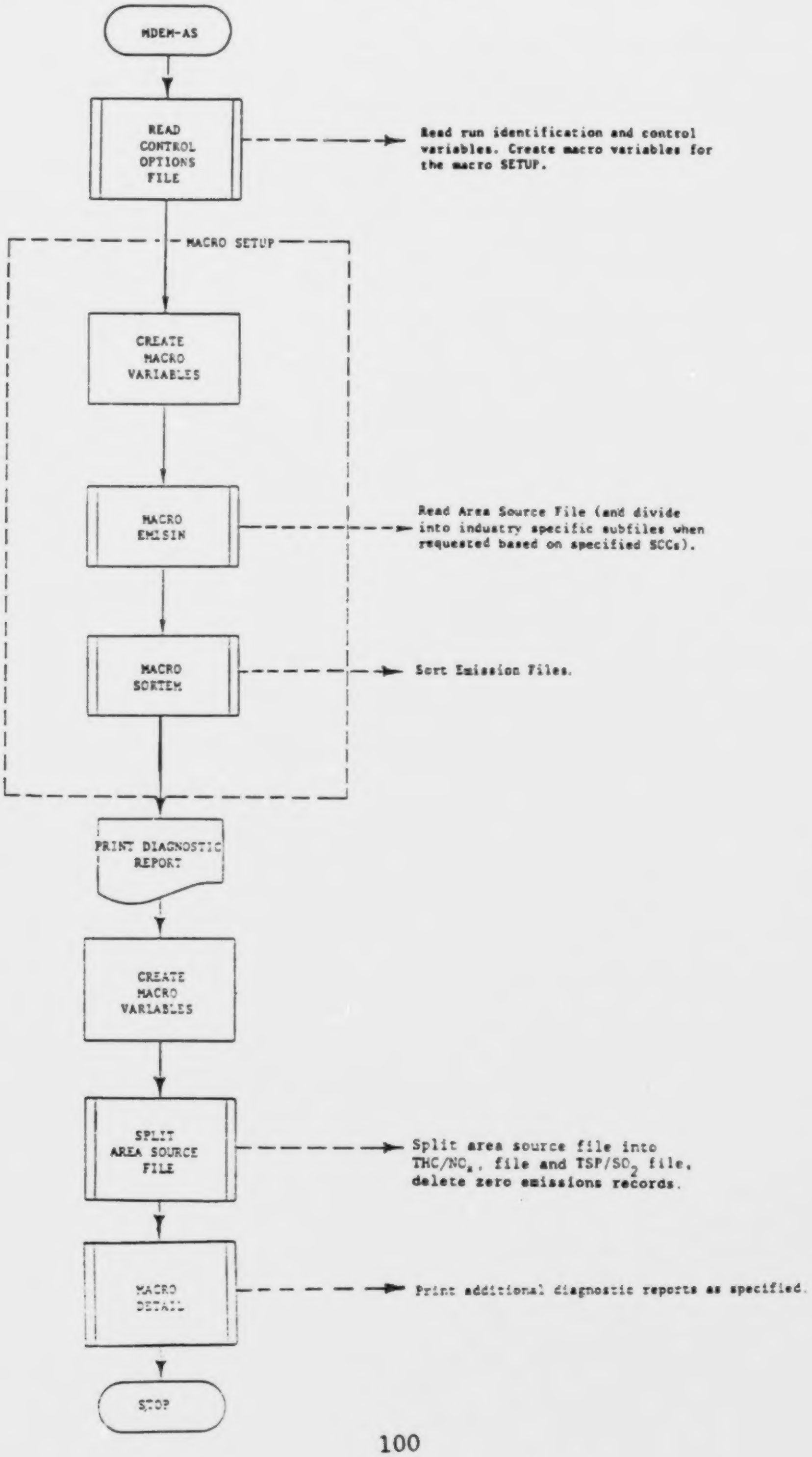

X-LOOP
X=1
SORT
&&SUBDD&X
...MAJOR
Major Point Sources Emission Subfile
&MINOR='Y'?
NO
YES
SORT
&&SUBDD&X
...MINOR
Minor Point Sources Emission Subfile
X=X+1
NO
X>&INDX2?
YES
RETURN
TO
MDEM

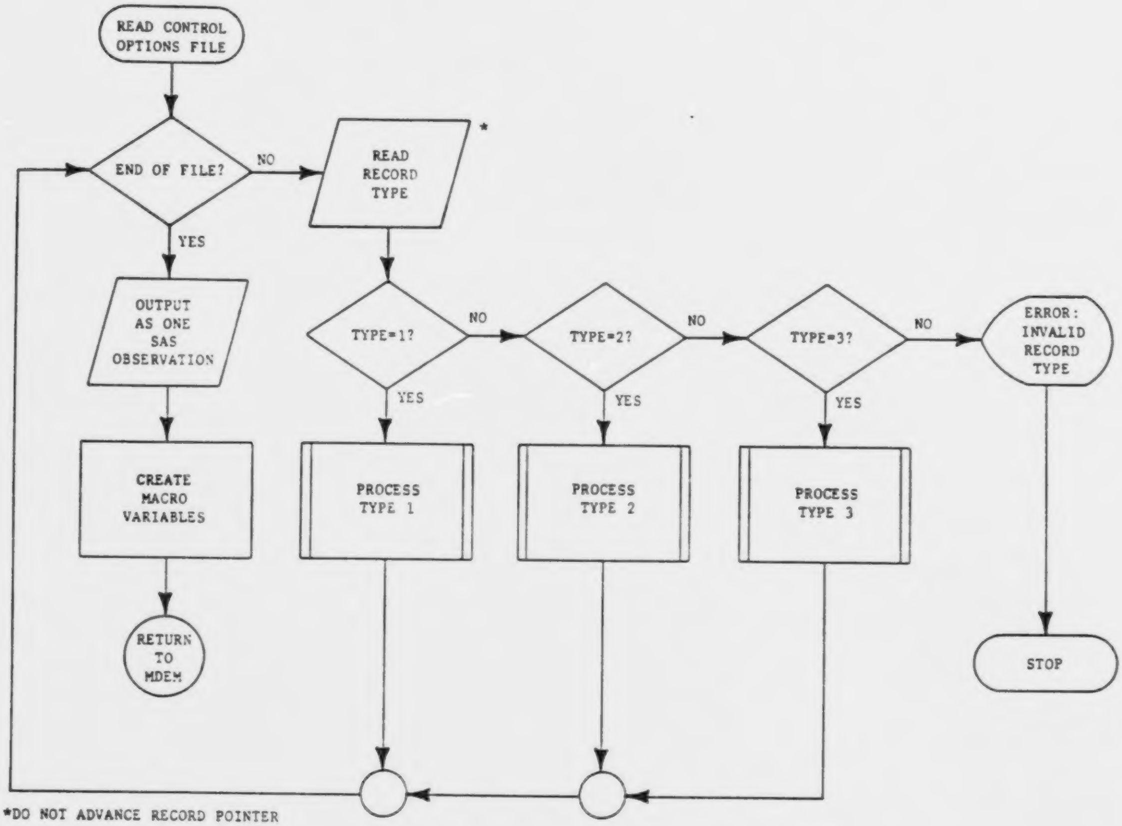

DETAIL
&DETAIL='D'?
NO
YES
PRINTOUT OF MAJMISC.DATA
Miscellaneous Major Point Sources Emission Subfile.
&MINOR='Y'?
NO
YES
PRINTOUT OF MINMISC.DATA
Miscellaneous Minor Point Sources Emission Subfile.
&INDX2>0?
NO
YES
X-LOOP
Print MAJOR/MINOR Point Sources Emission Files and Subfiles.
RETURN TO MDEM


X-LOOP
X=1
PRINTOUT OF &&SUBDD&X...MAJOR
Major Point Sources Emission Subfile
&MINOR='Y'?
NO
YES
PRINTOUT OF &&SUBDD&X...MINOR
Minor Point Sources Emission Subfile
X=X+1
NO
X>&INDX2?
YES
RETURN TO DETAIL

Model Data Extraction Module: Area Sources--

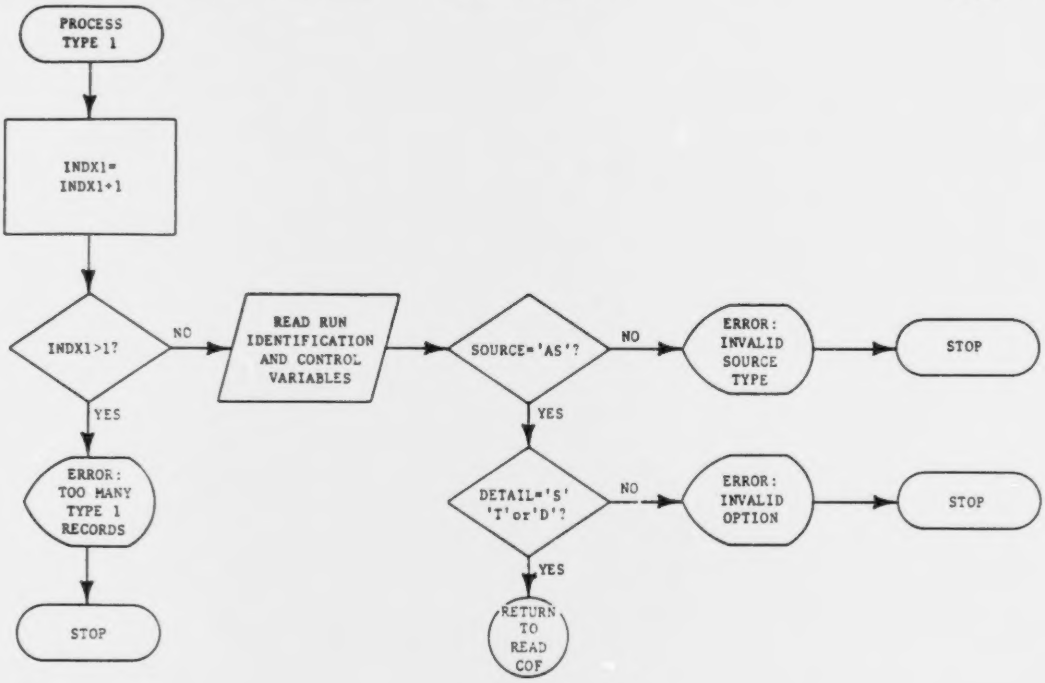
Page 1 of 8

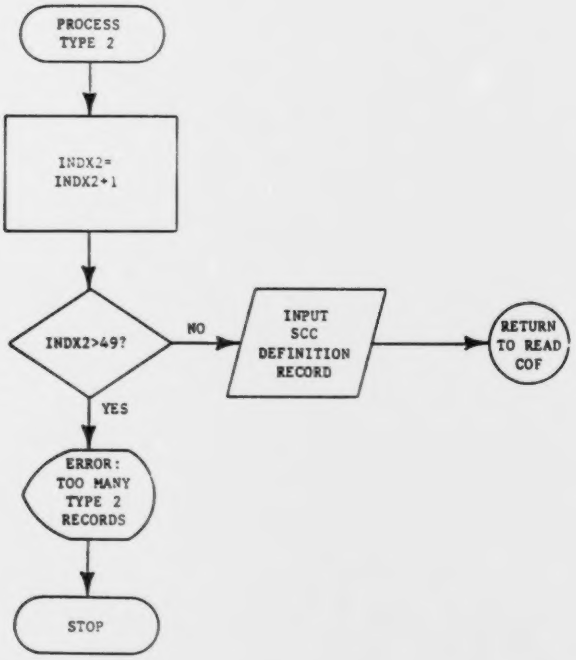

MDEM-AS
READ CONTROL OPTIONS FILE
Read run identification and control variables. Create macro variables for the macro SETUP.
MACRO SETUP
CREATE MACRO VARIABLES
MACRO EMISIN
Read Area Source File (and divide into industry specific subfiles when requested based on specified SCCs).
MACRO SORTEM
Sort Emission Files.
PRINT DIAGNOSTIC REPORT
CREATE MACRO VARIABLES
SPLIT AREA SOURCE FILE
Split area source file into THC/NO_x, file and TSP/SO_2 file, delete zero emissions records.
MACRO DETAIL
Print additional diagnostic reports as specified.
STOP


READ CONTROL OPTIONS FILE
END OF FILE?
NO
YES
READ RECORD TYPE
*
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABLES
RETURN TO MDEM
TYPE=1?
NO
YES
TYPE=2?
NO
YES
TYPE=3?
NO
YES
ERROR: INVALID RECORD TYPE
PROCESS TYPE 1
PROCESS TYPE 2
PROCESS TYPE 3
STOP

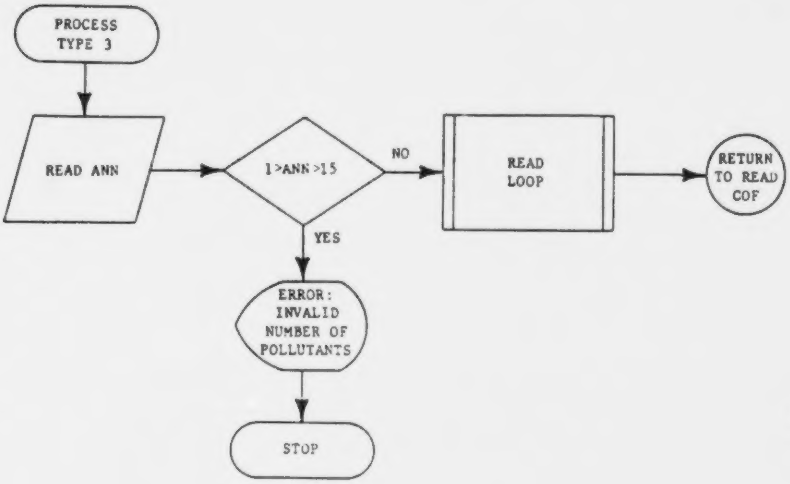
*DO NOT ADVANCE RECORD POINTER

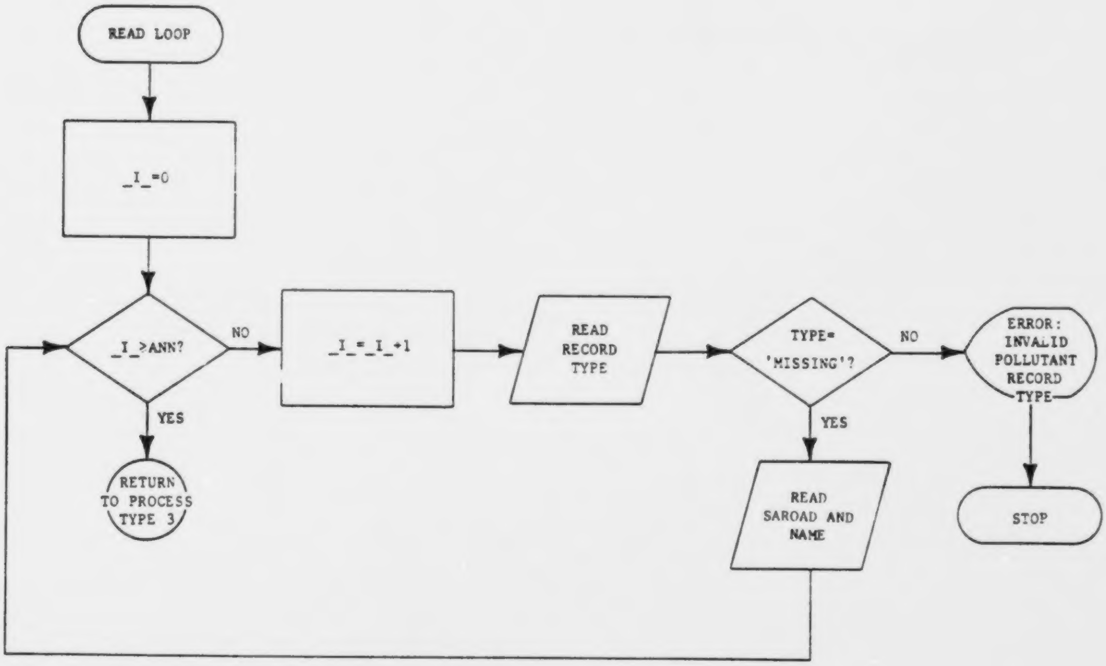
Model Data Extraction Module: Area Sources-- Page 3 of 8


PROCESS TYPE 1
INDX1= INDX1+1
INDX1>1?
NO
YES
ERROR: TOO MANY TYPE 1 RECORDS
STOP
READ RUN IDENTIFICATION AND CONTROL VARIABLES
SOURCE='AS'?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES
DETAIL='S' 'T'or'D'?
NO
ERROR: INVALID OPTION
STOP
YES
RETURN TO READ COF

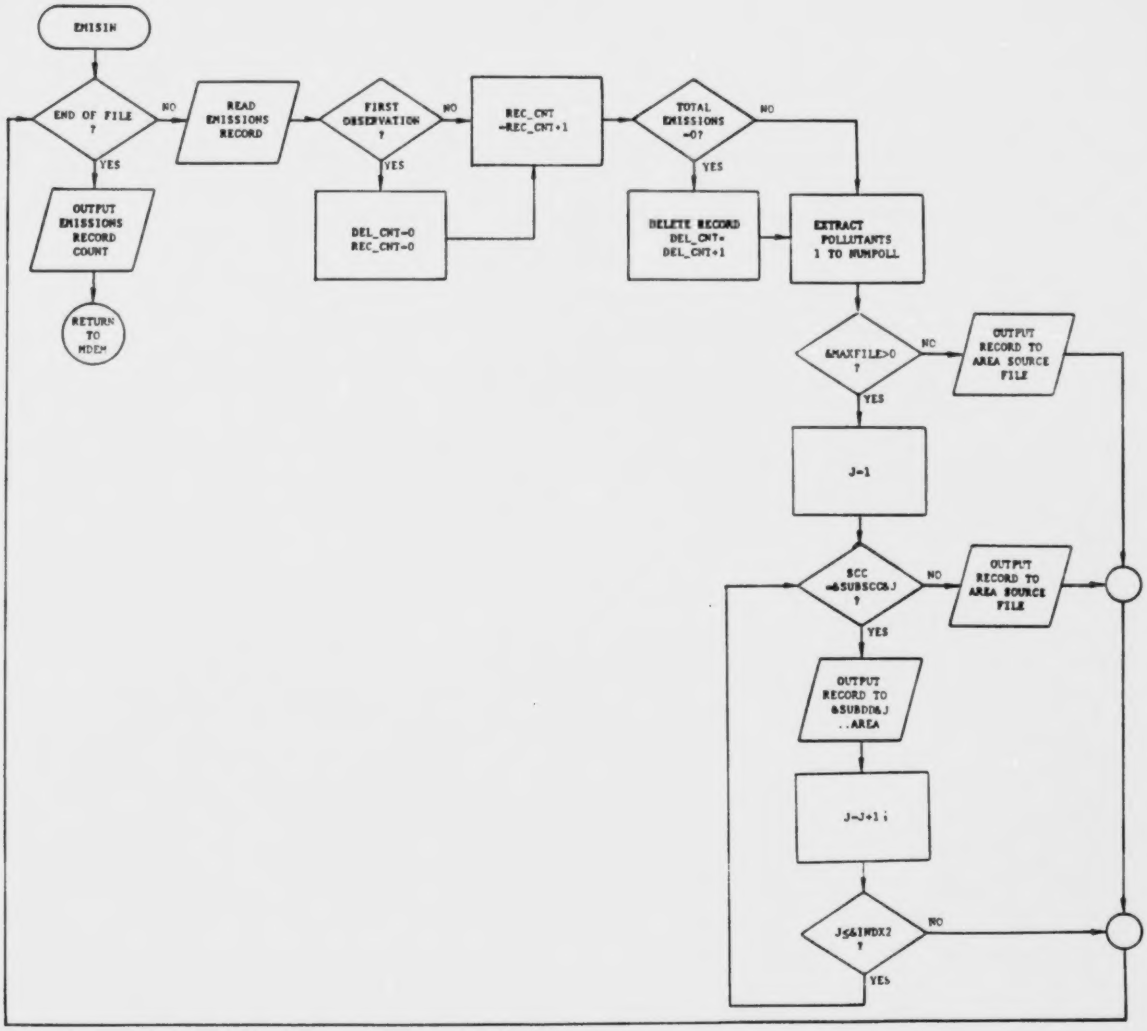

PROCESS TYPE 2
INDX2= INDX2+1
INDX2>49?
NO
INPUT SCC DEFINITION RECORD
RETURN TO READ COF
YES
ERROR: TOO MANY TYPE 2 RECORDS
STOP

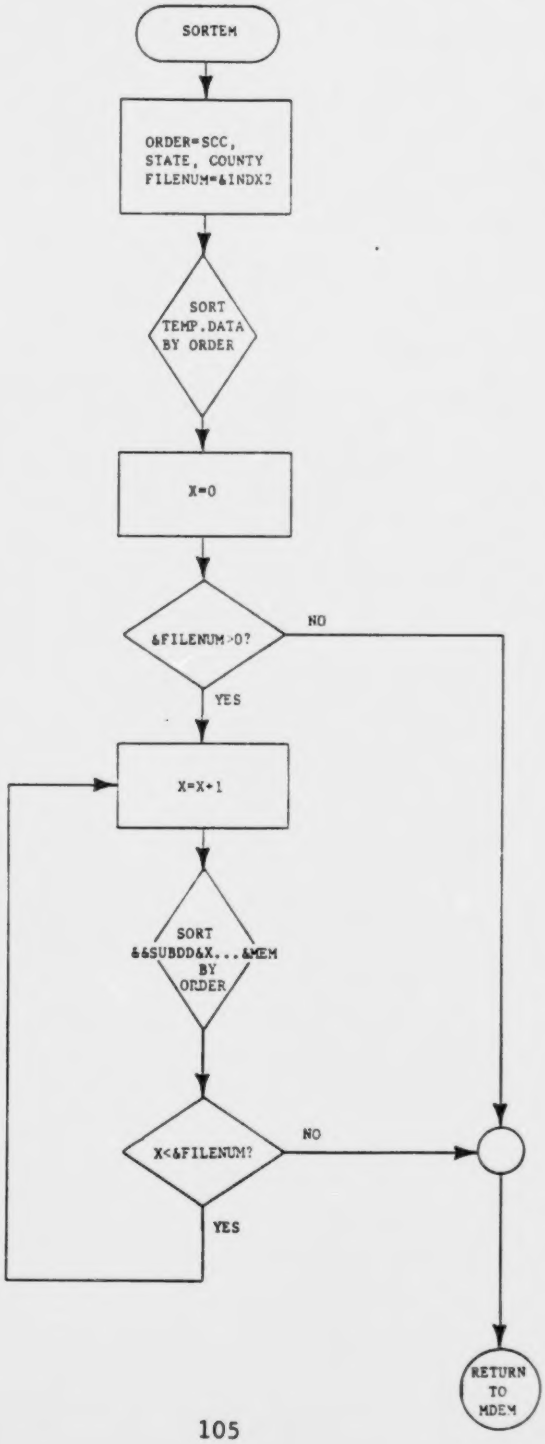
Model Data Extraction Module: Area Sources--

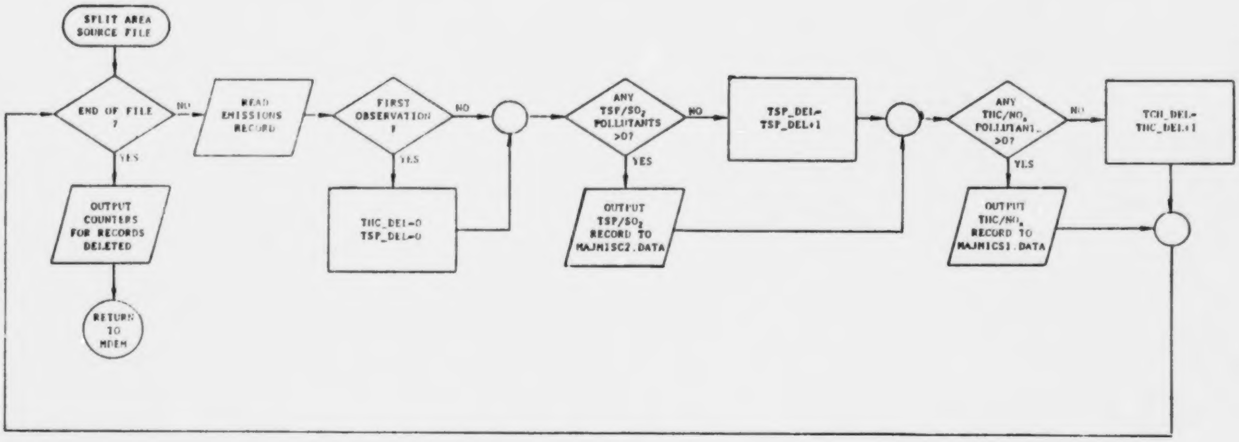

PROCESS TYPE 3
READ ANN
1>ANN>15
NO
READ LOOP
RETURN TO READ COF
YES
ERROR: INVALID NUMBER OF POLLUTANTS
STOP

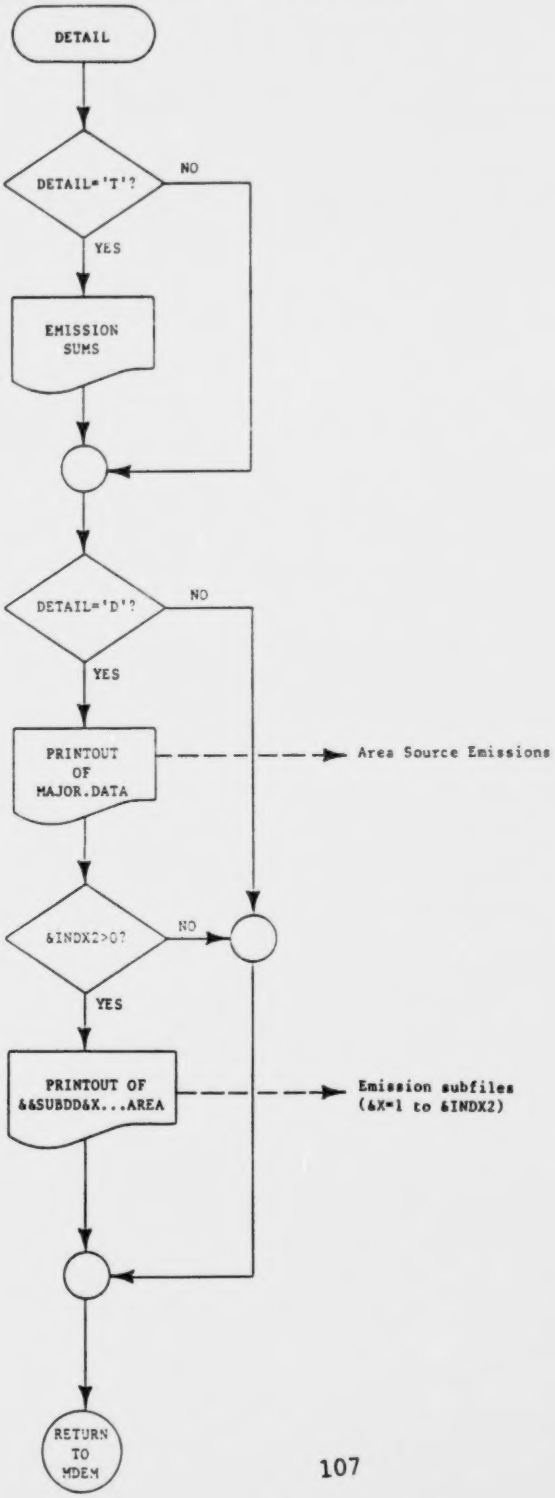

READ LOOP
_I_=0
_I_>ANN?
NO
_I_=_I_+1
READ RECORD TYPE
TYPE= 'MISSING'?
NO
ERROR: INVALID POLLUTANT RECORD TYPE
YES
RETURN TO PROCESS TYPE 3
YES
READ SAROAD AND NAME
STOP

Model Data Extraction Module: Area Sources-- Page 5 of 8


EMISIN
END OF FILE ?
NO
YES
READ EMISSIONS RECORD
FIRST OBSERVATION ?
NO
YES
REC_CNT =REC_CNT+1
DEL_CNT=0 REC_CNT=0
TOTAL EMISSIONS =0?
NO
YES
DELETE RECORD DEL_CNT= DEL_CNT+1
EXTRACT POLLUTANTS 1 TO NUMPOLL
OUTPUT EMISSIONS RECORD COUNT
RETURN TO MDEM
&MAXFILE>0 ?
NO
YES
OUTPUT RECORD TO AREA SOURCE FILE
J=1
SCC =&SUBSCC&J ?
NO
YES
OUTPUT RECORD TO AREA SOURCE FILE
OUTPUT RECORD TO &SUBDD&J ..AREA
J=J+1 ;
J≤&INDX2 ?
NO
YES


SORTEM
ORDER=SCC, STATE, COUNTY FILENUM=&INDX2
SORT TEMP.DATA BY ORDER
X=0
&FILENUM>0?
NO
YES
X=X+1
SORT &&SUBDD&X...&MEM BY ORDER
X<&FILENUM?
NO
YES
RETURN TO MDEM


SPLIT AREA SOURCE FILE
END OF FILE ?
NO
YES
OUTPUT COUNTERS FOR RECORDS DELETED
RETURN TO MDEM
READ EMISSIONS RECORD
FIRST OBSERVATION ?
NO
YES
THC_DEL=0 TSP_DEL=0
ANY TSP/SO$_2$ POLLUTANTS >0?
NO
YES
TSP_DEL= TSP_DEL+1
OUTPUT TSP/SO$_2$ RECORD TO MAJMISC2.DATA
ANY THC/NO$_x$ POLLUTANTS >0?
NO
YES
TCH_DEL= THC_DEL+1
OUTPUT THC/NO$_x$ RECORD TO MAJMICS1.DATA


DETAIL
DETAIL='T'?
NO
YES
EMISSION SUMS
DETAIL='D'?
NO
YES
PRINTOUT OF MAJOR.DATA
Area Source Emissions
&INDX2>0?
NO
YES
PRINTOUT OF &&SUBDD&X...AREA
Emission subfiles (&X=1 to &INDX2)
RETURN TO MDEM

TEMPORAL ALLOCATION MODULE

Point and area source emissions output from one of FREDS modules are temporally resolved in the Temporal Allocation Module (TAM). Input to TAM includes the Temporal Allocation Factor File (TAFF), a SAS data set containing temporal allocation factors which present a series of fractional multipliers representing the seasonal, daily, and hourly percentages of annual emissions for each SCC. The fractional multipliers in the TAFF are merged with each emissions record based on SCC, State, and county.

The TAFF provides allocation factors for up to 12 "typical" days (a weekday, Saturday, and Sunday in each season). Each allocation factor record has one or more identifiers (e.g., State, SCC, plant, point) which serve to match emission records to the appropriate set of temporal factors. TAM matches emissions from each record with the appropriate set of allocation factors by starting with the most specific level of factor definition (point for point sources and state for area sources), and deferring, in steps, to the least specific (e.g., general overall pattern for a given SCC). As an exception, seasonal factors for point sources are derived primarily from seasonal throughput percentages on the emissions records themselves; seasonal factors from the TAFF are used secondary. For point sources, if no profile is supplied for an SCC in the TAFF, TAM generates a temporal pattern based on the operating schedule data found in the emissions record. If the operating schedule data are missing or incomplete, a uniform, default pattern is assigned, and a warning message is written to the diagnostic report. If area source temporal factors are missing from the TAFF, a uniform pattern is assigned.

For area source processing, after emissions records are merged with corresponding temporal allocation fractions, the hourly factors are offset from local time to Greenwich Mean Time (GMT) based on information previously extracted from the Time Zone File, i.e., state and county codes, a time zone flag and a daylight savings flag. The merged file is output in EBCDIC format and sorted by Column and Row for gridded emissions or SCC, State, and county for nongridded emissions. The merged file is processed by MTPREP.FORT (a FORTRAN subroutine which multiplies emissions by their temporal factors), and MTPREP.SAS (a SAS subroutine which converts EBCDIC characters to SAS format), producing hourly gridded or county-level emissions totals. Temporally resolved area source emissions are output for further processing in FREDS.

For point sources, the Time Zone File is read into a SAS data set and merged with the emissions file. Point source emission records are then merged with their corresponding temporal allocation factors, as described above. Point source hourly temporal factors supplied in local time are offset to GMT based on data extracted from the Time Zone File and the temporal scenario number. Point source emission records containing temporal factors (adjusted to GMT) are then output for further FREDS processing.

Also output is a diagnostic report including summary statistics documenting the actions performed by TAM. An optional hard copy listing of emissions records and corresponding temporal allocation factors is available for both point and area sources. The point source detailed report is limited to 10 observations since each point source TAM output record contains more than 300 temporal factors. For area sources, the detailed diagnostic report prints the first 30 observations.

Flow Chart and Description

Detailed descriptions of TAM processing for point and area sources are given in the accompanying flow charts and are described below. An individual "set" of flow charts is presented for both point and area sources. The first diagram of each set represents the overall module flow. Processes depicted by double vertical lines indicate the presence of several subprocesses, and hence a second level of more detailed diagrams are presented for these. For example, the first double-lined process is "READ CONTROL OPTIONS FILE". Starting on the next page, the reader will find a second-level chart with the same name. On completion of the second level of subprocesses, the user returns to the first level. The user would then continue on the first level until the next double-lined process is encountered - "READ TIME ZONE FILE". Again, the reader refers to a second level diagram. This continues until the reader has encountered all processes depicted on the main module flow chart. The area source flow chart reflects the flexibility of TAM in accepting either gridded or county-level emissions.

TAM first reads and validates the Control Options File (COF) and stores these options in a SAS data set. The COF for area source processing contains values for the temporal scenario desired, the level of detail of the diagnostic report, the SAS member name of the input and output emissions files, a run identification header, level of resolution of the emissions file, and a pollutant variable list. For point sources, the Run Identification record contains the level of detail of the diagnostic report, the SAS member name of the emissions file, the number of days (i.e., scenarios) in the Temporal Allocation Factor File, and the run identification header. Within the main TAM program, macro variables are created from control options input and retained for further point source and area source processing. For point sources, TAFDAY identifies the number of temporal scenarios for the PSTAF macro and SASMEM is the SAS member name of the input and output emissions files. The area source macro variables created in the main program (TAFDAY, SASMEM, LIST, DAYLITE, and EMRES) direct TAM to the appropriate temporal scenario, SAS member name of the input emissions file, pollutant variable list, daylight savings flag, and level of resolution of the emissions file (e.g., gridded or nongridded).

Point source execution of TAM is controlled by the SAS macro routine EXECUTE. Within EXECUTE, the Time Zone File is read and the merge subroutine, PSTAF, is invoked. For area sources, the ASTAF macro is invoked from the body of the main program.

Further processing of the temporal data differs for point and area source emissions files. For area sources, the subroutine ASTAF merges the TAFF with the emissions file by SCC and State. All matches at this level are output. The remaining records are merged by SCC and output. Nonmatches are then assigned a default pattern of temporally uniform emissions and output. The three merged output files are interleaved to reflect the original order.

In the ASTAF subroutine, variables previously extracted in from the Time Zone File are used to offset local time to GMT. ASTAF then outputs emissions and temporal allocation factors, converts from SAS to EBCDIC format and sorts by Column and Row or SCC, State and county using the IBM utility SYNCSORT. The level of resolution of the area source emissions (Column, Row or SCC, state, county) to be sorted is specified by the control variable EMRES. To determine the appropriate sort fields, the user should refer to "User Supplied JCL" for TAM in the Control Statements section. The sorted data set is passed on to the subroutine MTPREP.FORT which multiplies emissions by the appropriate temporal allocation factors and outputs EBCDIC hourly emissions totals. MTPREP.SAS then converts the hourly emissions from EBCDIC to SAS and outputs the area source file for further FREDS processing. The number of pollutants and level of resolution of the emissions file for MTPREP.FORT and MTPREP.SAS are specified by the user in the MTPREP control file.

For point sources, the processing macro, EXECUTE, reads and sorts the Time Zone File by State and county. Pertinent variables (e.g., SCC, State, county, Plant ID, Point ID) from the emissions file are subset into a temporary data set and merged with the Time Zone File. The merged file is resorted by SCC, State, county, Plant ID and Point ID and merged with the point source emissions file by the above sort variables. This file is output to a temporary data set for temporal processing in the PSTAF macro, also invoked within EXECUTE. Emissions records with no time zone data are output to a temporay SAS data set and printed with the diagnostic report.

The macro subroutine PSTAF first merges temporal factors with the emissions file by SCC, State, county, plant and point. Matches at this level are output. Records are subsequently merged by SCC, State, and county, or by SCC and State, and output. The remaining records are merged by SCC and output, similar to area source processing. Where no patterns are supplied in the Temporal Allocation Factor File, temporal factors are generated using the operating schedules contained on the emissions records. However, operating schedule data (as seasonal throughputs) are the primary source of seasonal factors; TAFF seasonal factors are used secondarily. If the operating schedules are missing or incomplete, and no profile is present in the TAFF, a uniform temporal pattern is generated by TAM. The temporary output files are interleaved to reflect the original order. Prior to output, the PSTAF macro offsets hourly fractions, reported in local time, to GMT based on the Time Zone File variables and temporal scenario number.

When the point source temporal allocation process is complete, all the observations in the emissions file contain the proper temporal allocation factors and an emissions file is output containing unresolved emissions, time zone data, and corresponding temporal allocation factors.

A diagnostic report is generated which contains, at the summary level, processing information, run identification information, and accounting data. Emission records without time zone data are also printed. If the optional detailed report is requested, the SAS Print procedure will be invoked to provide a subsetted listing of temporal allocation factors (10 observations from the point source file or 30 observations from the area source file).

Peripheral Software

Before input to FREDS, the mathematical validity of the Temporal Allocation Factor File is ensured by running the Temporal Allocation Factor Preprocessor (TAFP). The TAFP performs five checks:

1. For a given SCC, State, county TAF group, scenarios 1 through 12 are present and in sequence;

2. The sum of hourly factors over a day is 1.0;

3. The weighted sum of daily factors over a season is 1.0: (65 x weekday factor) + (13 x Saturday factor) + (13 x Sunday factor) = 1.0;

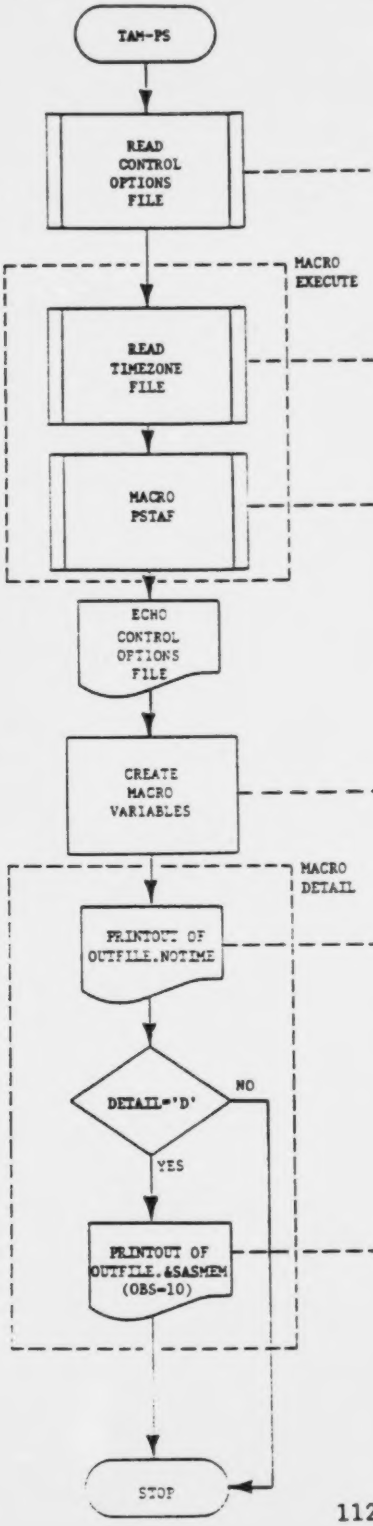
4. The sum of seasonal factors over a year is also 1.0;

5. Seasonal factors do not vary over the 3 days within one season.

In early versions of the TAFF file, storage of the temporal factors as 3- to 4-column fields in EBCDIC data files led to rounding errors which produced inaccuracies in annual emissions totals on reaggregation. This problem was avoided by storing the temporal factors in SAS data sets; the accuracy of the factors is limited only by the machine precision of the IBM mainframe.

The methodologies devised to normalize the factors and create the temporal allocation factor (TAF) SAS data sets were different for point and area source TAFs. This was necessary due to differences in point and area source TAM processing. Since each temporal scenario is processed separately for area sources, each record in the temporal factor SAS data set contains one seasonal factor, one daily factor, and 24 hourly factors for that scenario. By contrast, each record in the point source TAF SAS data set contains the four seasonal factors, 12 daily factors and 288 hourly factors which comprise the entire temporal profile for a particular SCC.

Temporal Allocation Module: Point Sources-- Page 1 of 8


TAM-PS
READ CONTROL OPTIONS FILE
MACRO EXECUTE
READ TIMEZONE FILE
MACRO PSTAF
ECHO CONTROL OPTIONS FILE
CREATE MACRO VARIABLES
MACRO DETAIL
PRINTOUT OF OUTFILE.NOTIME
DETAIL='D'
NO
YES
PRINTOUT OF OUTFILE.&SASMEM (OBS=10)
STOP

Read run identification, control variables, and pollutant list and control variables. Create macro variables (no poll list).

Read in Timezone File and merge with emissions.

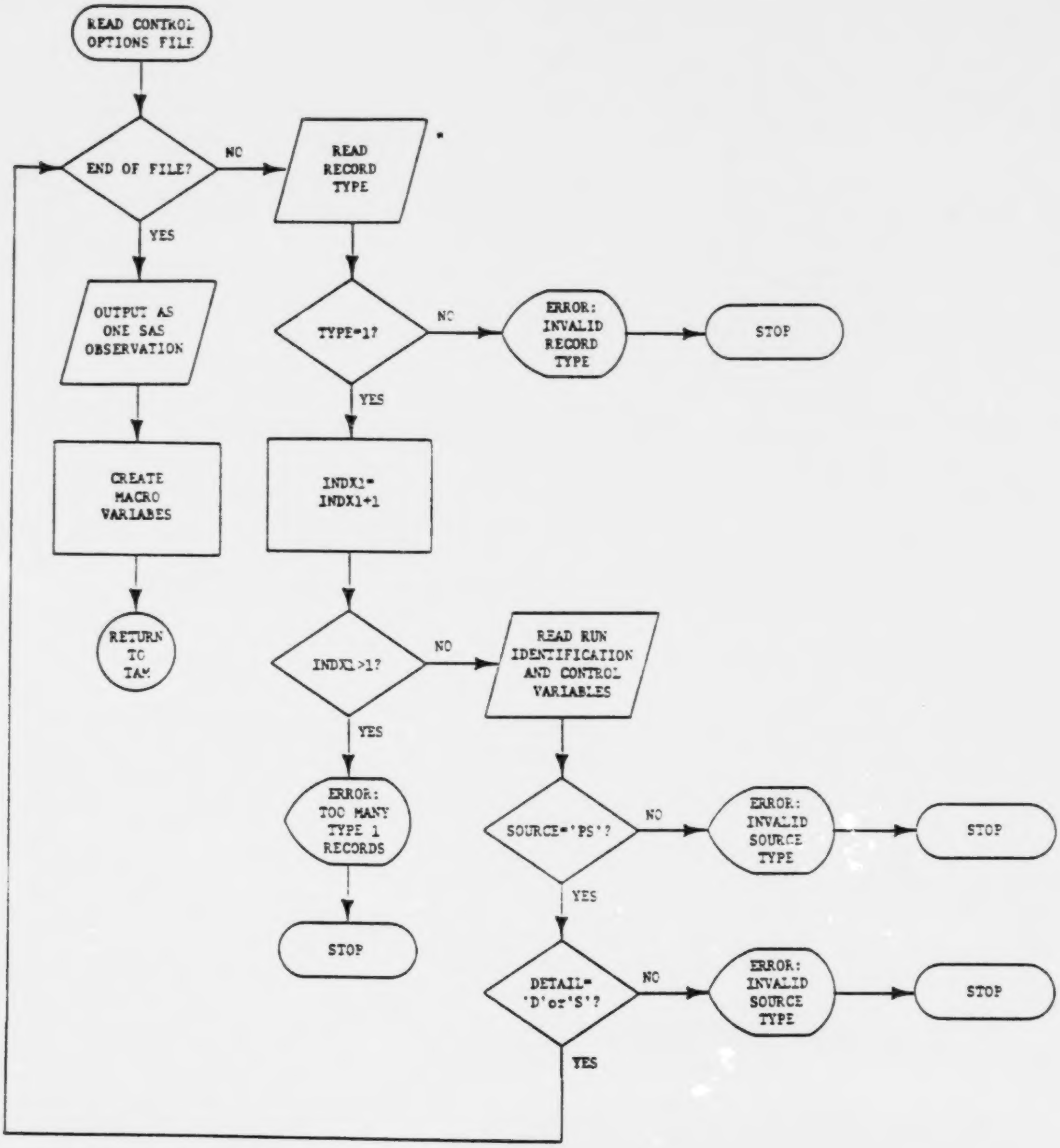
Read in Temporal Allocation Factor File and merge with emissions variables.

Define Detail and SASMEM for generation of detailed diagnostic report.

Emission records with no timezone data

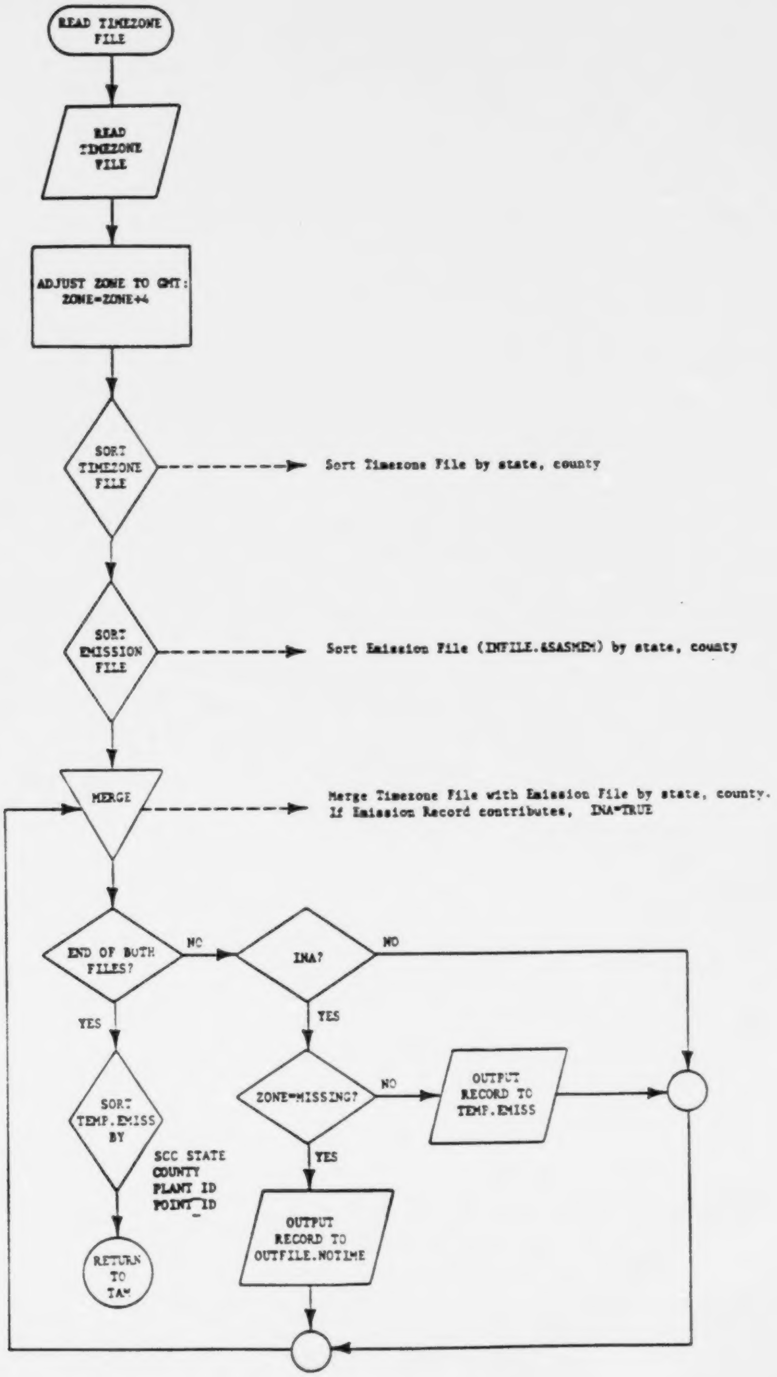
Emissions records with corresponding temporal factors

Temporal Allocation Module: Point Sources--

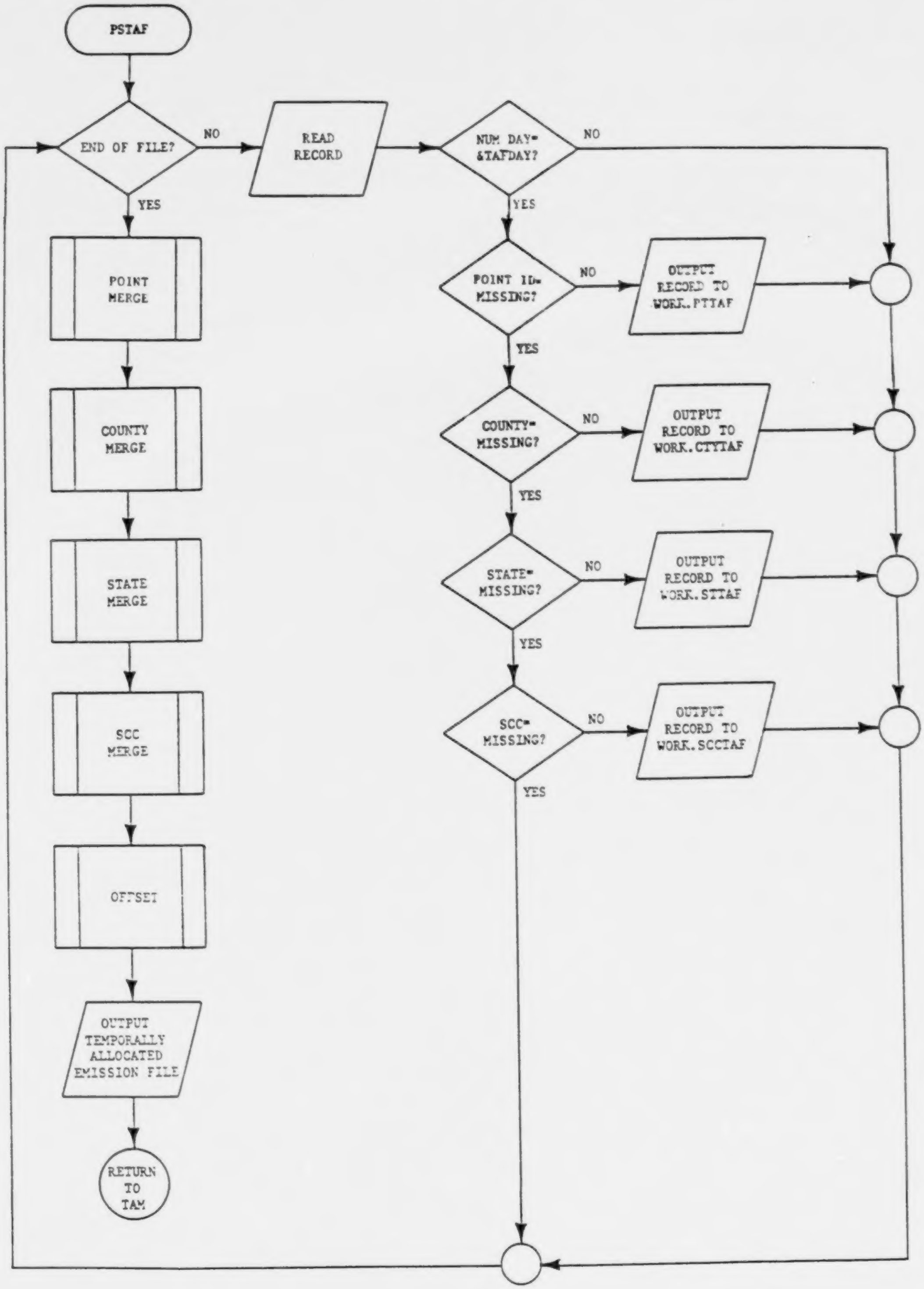

READ CONTROL OPTIONS FILE
END OF FILE?
NO
READ RECORD TYPE
*
YES
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABES
RETURN TO TAM
TYPE=1?
NO
ERROR: INVALID RECORD TYPE
STOP
YES
INDX1=INDX1+1
INDX1>1?
NO
READ RUN IDENTIFICATION AND CONTROL VARIABLES
YES
ERROR: TOO MANY TYPE 1 RECORDS
STOP
SOURCE='PS'?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES
DETAIL='D'or'S'?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES

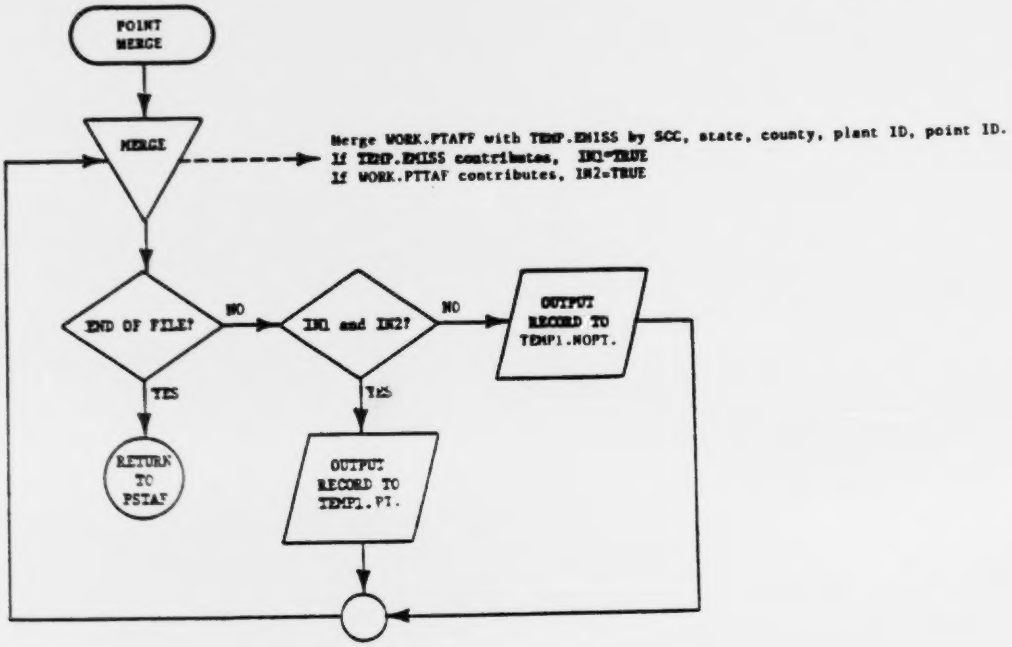
*DO NOT ADVANCE RECORD POINTER

Temporal Allocation Module: Point Sources-- Page 3 of 8

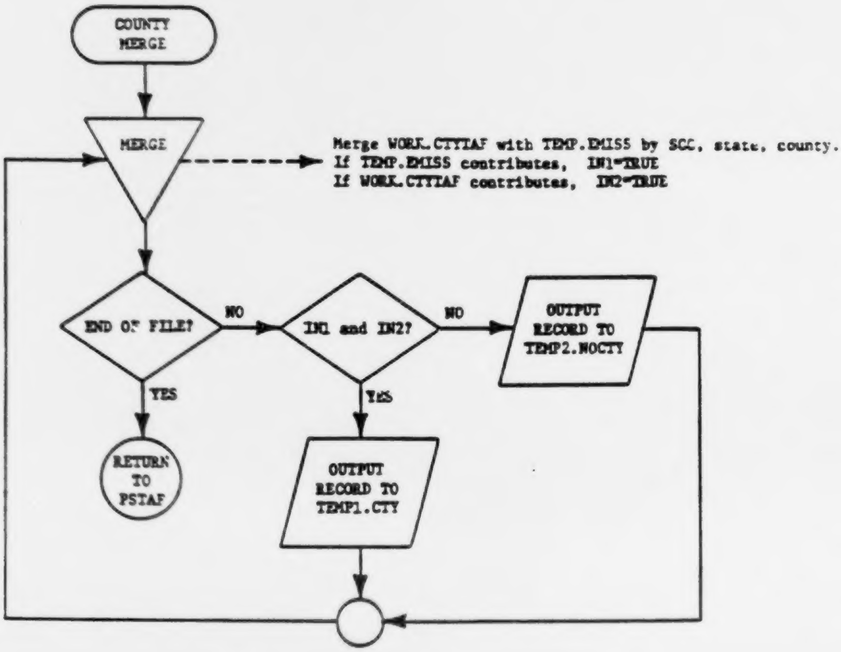

READ TIMEZONE FILE
READ TIMEZONE FILE
ADJUST ZONE TO GMT: ZONE=ZONE+4
SORT TIMEZONE FILE
Sort Timezone File by state, county
SORT EMISSION FILE
Sort Emission File (INFILE.&SASMEM) by state, county
MERGE
Merge Timezone File with Emission File by state, county.
If Emission Record contributes, INA=TRUE
END OF BOTH FILES?
NO
INA?
NO
YES
YES
SORT TEMP.EMISS BY
SCC STATE
COUNTY
PLANT ID
POINT_ID
RETURN TO TAM
ZONE=MISSING?
NO
OUTPUT RECORD TO TEMP.EMISS
YES
OUTPUT RECORD TO OUTFILE.NOTIME

Temporal Allocation Module: Point Sources--


PSTAF
END OF FILE?
NO
YES
READ RECORD
NUM DAY= &TAFDAY?
NO
YES
POINT ID= MISSING?
NO
OUTPUT RECORD TO WORK.PTTAF
YES
COUNTY= MISSING?
NO
OUTPUT RECORD TO WORK.CTYTAF
YES
STATE= MISSING?
NO
OUTPUT RECORD TO WORK.STTAF
YES
SCC= MISSING?
NO
OUTPUT RECORD TO WORK.SCCTAF
YES
POINT MERGE
COUNTY MERGE
STATE MERGE
SCC MERGE
OFFSET
OUTPUT TEMPORALLY ALLOCATED EMISSION FILE
RETURN TO TAM

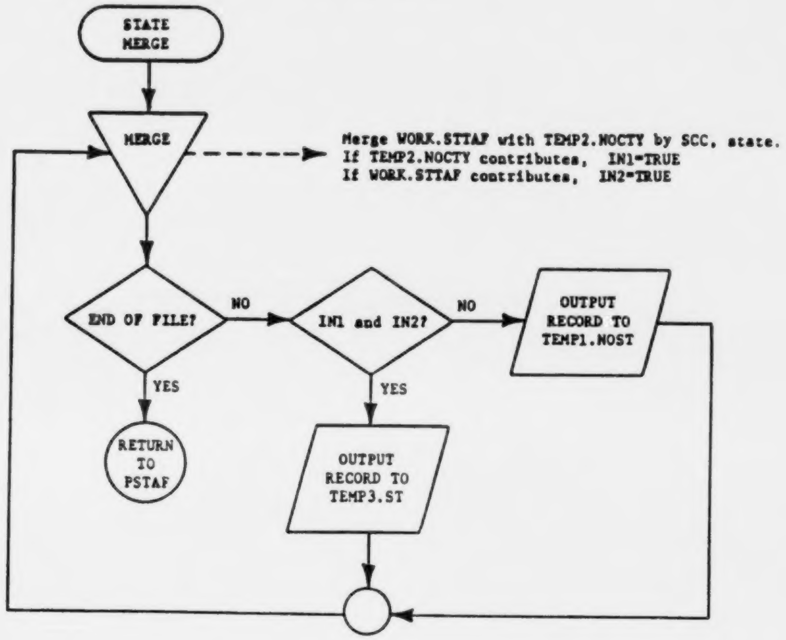

POINT MERGE
MERGE
END OF FILE?
NO
YES
RETURN TO PSTAF
IN1 and IN2?
NO
YES
OUTPUT RECORD TO TEMP1.NOPT.
OUTPUT RECORD TO TEMP1.PT.

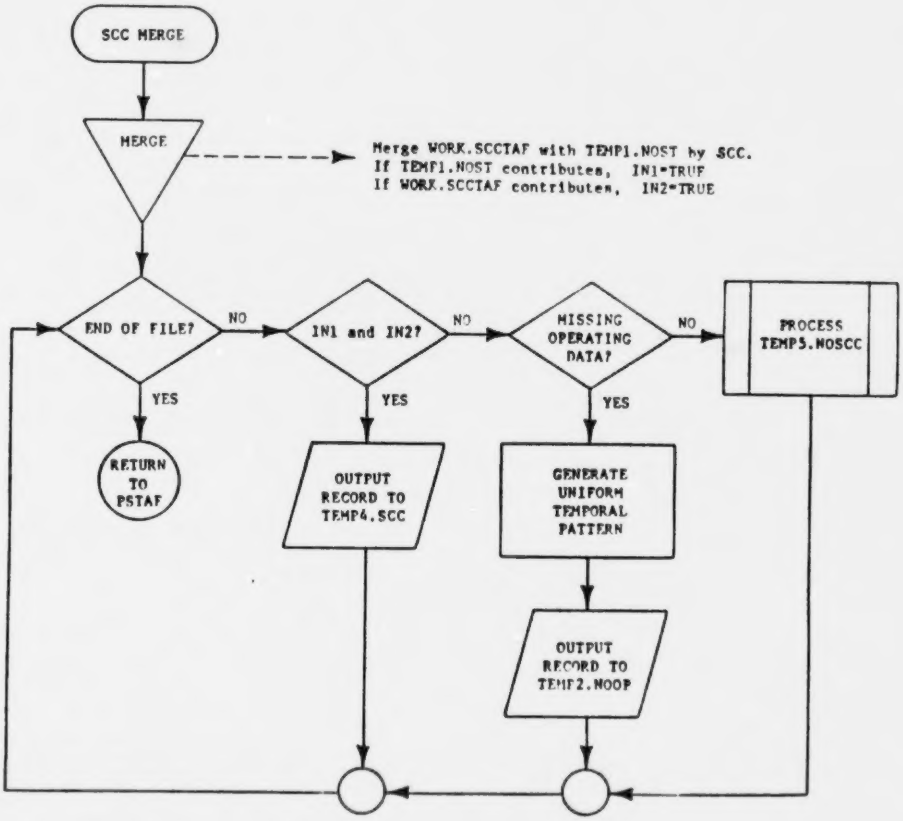
Merge WORK.PTAFF with TEMP.EMISS by SCC, state, county, plant ID, point ID.
If TEMP.EMISS contributes, IN1=TRUE
If WORK.PTTAF contributes, IN2=TRUE

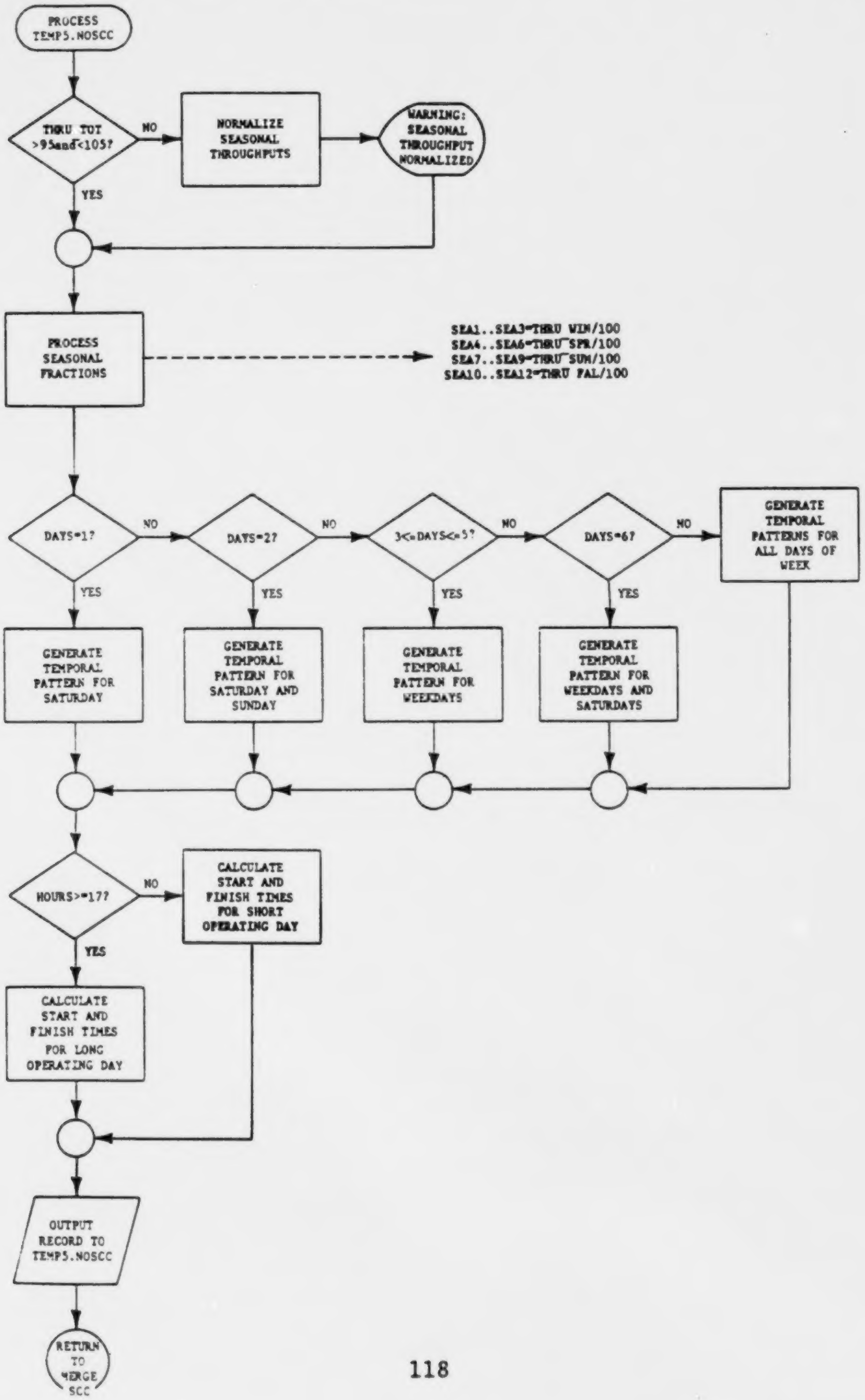

COUNTY MERGE
MERGE
END OF FILE?
NO
YES
RETURN TO PSTAF
IN1 and IN2?
NO
YES
OUTPUT RECORD TO TEMP2.NOCTY
OUTPUT RECORD TO TEMP1.CTY

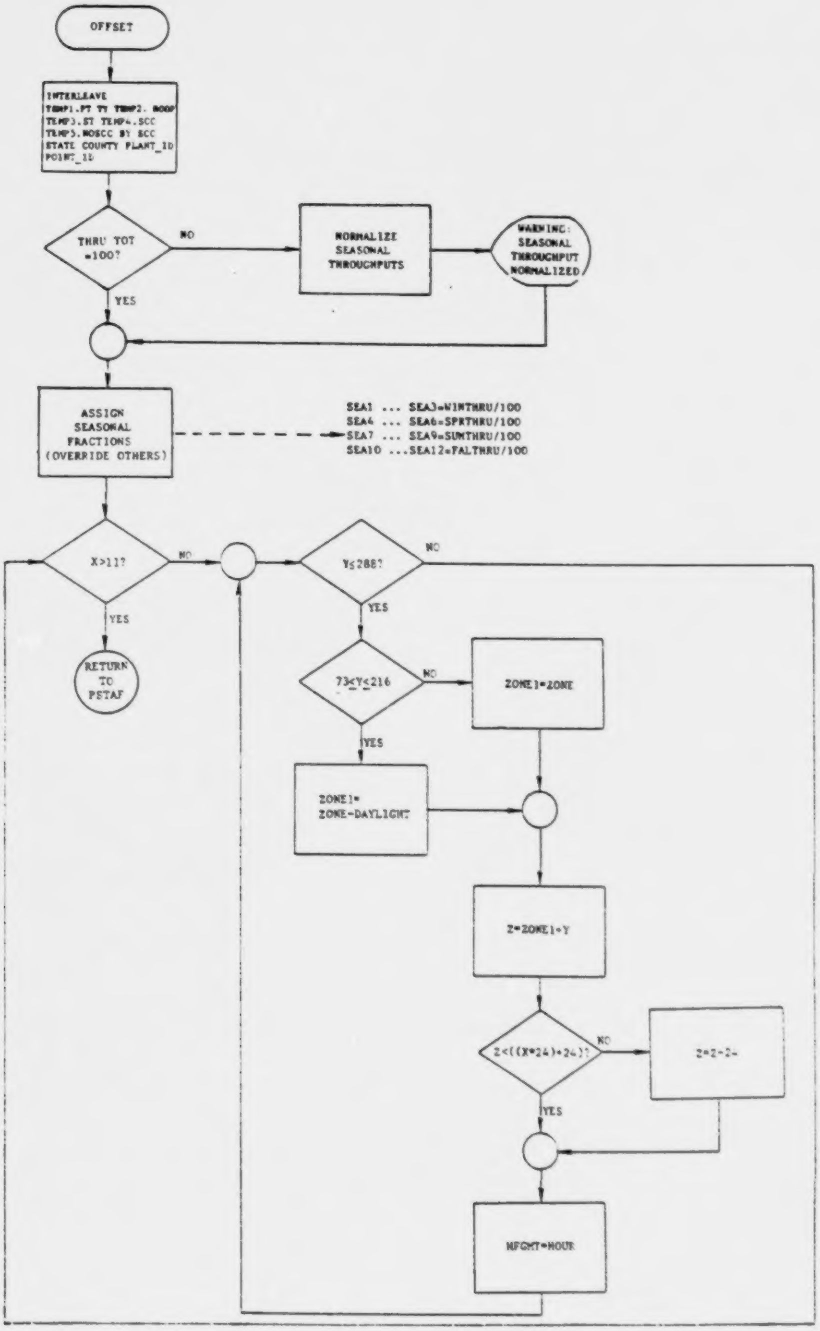
Merge WORK.CTYTAF with TEMP.EMISS by SCC, state, county.
If TEMP.EMISS contributes, IN1=TRUE
If WORK.CTYTAF contributes, IN2=TRUE

Temporal Allocation Module: Point Sources--


STATE MERGE
MERGE
Merge WORK.STTAF with TEMP2.NOCTY by SCC, state.
If TEMP2.NOCTY contributes, IN1=TRUE
If WORK.STTAF contributes, IN2=TRUE
END OF FILE?
NO
YES
RETURN TO PSTAF
IN1 and IN2?
NO
YES
OUTPUT RECORD TO TEMP1.NOST
OUTPUT RECORD TO TEMP3.ST

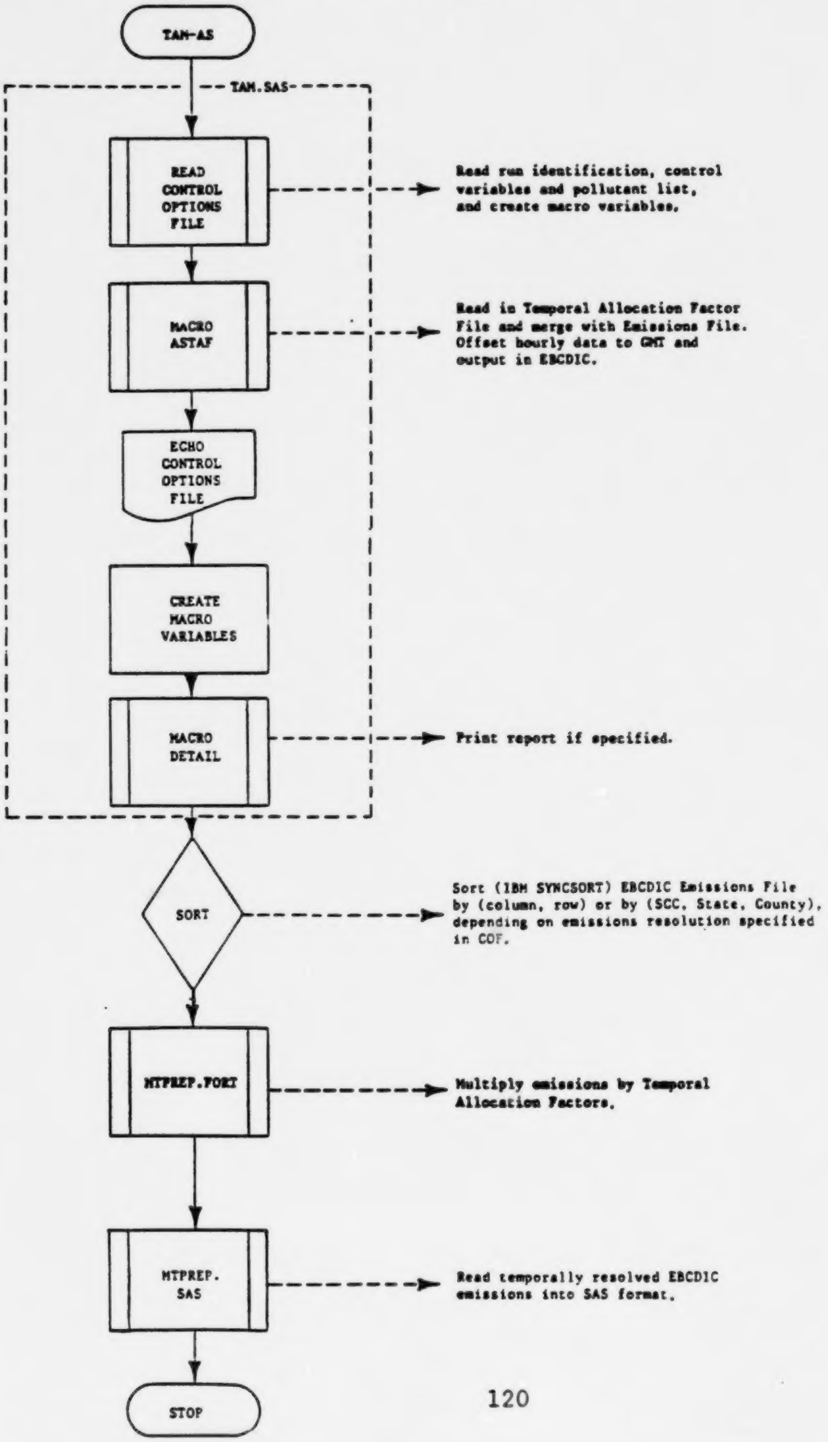

SCC MERGE
MERGE
Merge WORK.SCCTAF with TEMP1.NOST by SCC.
If TEMP1.NOST contributes, IN1=TRUE
If WORK.SCCTAF contributes, IN2=TRUE
END OF FILE?
NO
YES
RETURN TO PSTAF
IN1 and IN2?
NO
YES
OUTPUT RECORD TO TEMP4.SCC
MISSING OPERATING DATA?
NO
YES
PROCESS TEMP5.NOSCC
GENERATE UNIFORM TEMPORAL PATTERN
OUTPUT RECORD TO TEMP2.NOOP


PROCESS TEMP5.NOSCC
THRU TOT >95and<105?
NO
NORMALIZE SEASONAL THROUGHPUTS
WARNING: SEASONAL THROUGHPUT NORMALIZED
YES
PROCESS SEASONAL FRACTIONS
SEA1..SEA3=THRU WIN/100
SEA4..SEA6=THRU SPR/100
SEA7..SEA9=THRU SUM/100
SEA10..SEA12=THRU FAL/100
DAYS=1?
NO
DAYS=2?
NO
3<=DAYS<=5?
NO
DAYS=6?
NO
GENERATE TEMPORAL PATTERNS FOR ALL DAYS OF WEEK
YES
YES
YES
YES
GENERATE TEMPORAL PATTERN FOR SATURDAY
GENERATE TEMPORAL PATTERN FOR SATURDAY AND SUNDAY
GENERATE TEMPORAL PATTERN FOR WEEKDAYS
GENERATE TEMPORAL PATTERN FOR WEEKDAYS AND SATURDAYS
HOURS>=17?
NO
CALCULATE START AND FINISH TIMES FOR SHORT OPERATING DAY
YES
CALCULATE START AND FINISH TIMES FOR LONG OPERATING DAY
OUTPUT RECORD TO TEMP5.NOSCC
RETURN TO MERGE SCC

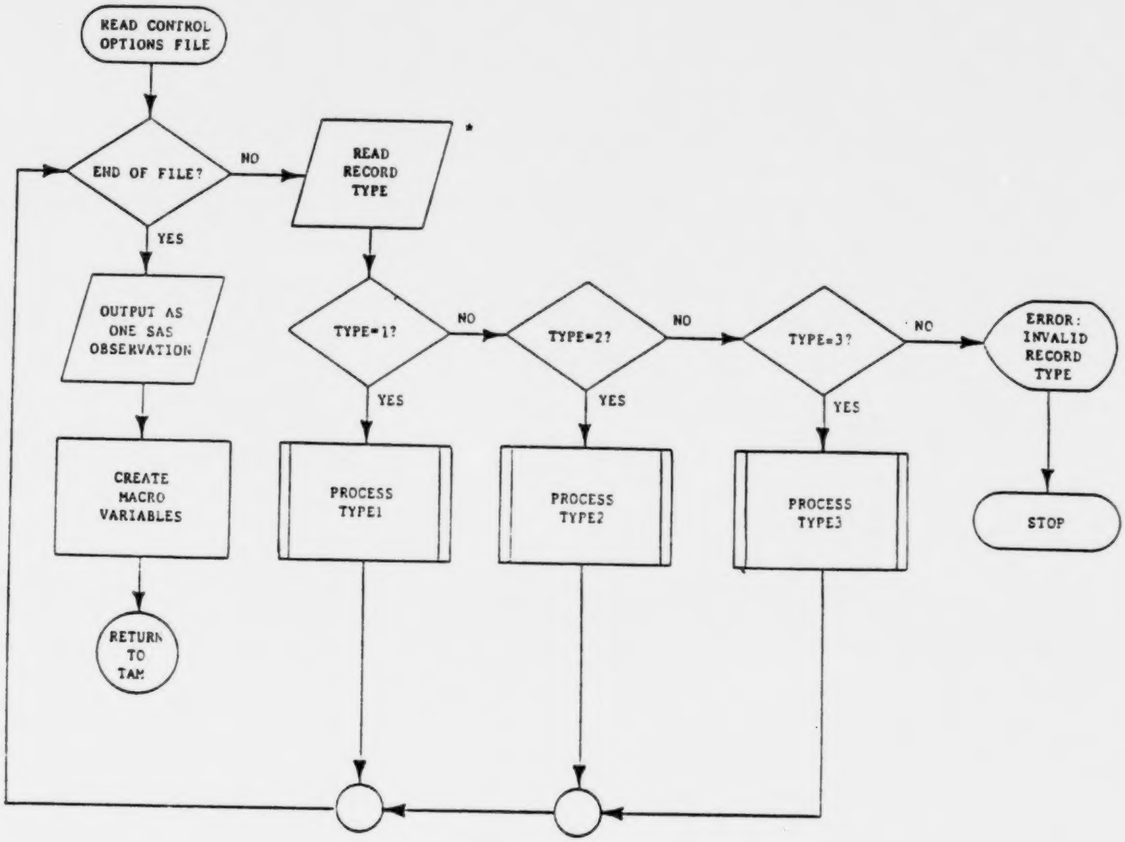

OFFSET
INTERLEAVE
TEMP1.PT TY TEMP2.NOOP
TEMP3.ST TEMP4.SCC
TEMP5.NOSCC BY SCC
STATE COUNTY PLANT_ID
POINT_ID
THRU TOT =100?
NO
NORMALIZE SEASONAL THROUGHPUTS
WARNING: SEASONAL THROUGHPUT NORMALIZED
YES
ASSIGN SEASONAL FRACTIONS (OVERRIDE OTHERS)
SEA1 ... SEA3=WINTHRU/100
SEA4 ... SEA6=SPRTHRU/100
SEA7 ... SEA9=SUMTHRU/100
SEA10 ...SEA12=FALTHRU/100
X>11?
NO
YES
RETURN TO PSTAF
Y≤288?
NO
YES
73≤Y≤216
NO
ZONE1=ZONE
YES
ZONE1= ZONE-DAYLIGHT
Z=ZONE1+Y
Z<((X*24)+24)?
NO
Z=Z-24
YES
NFGMT=HOUR

Temporal Allocation Module: Area Sources--

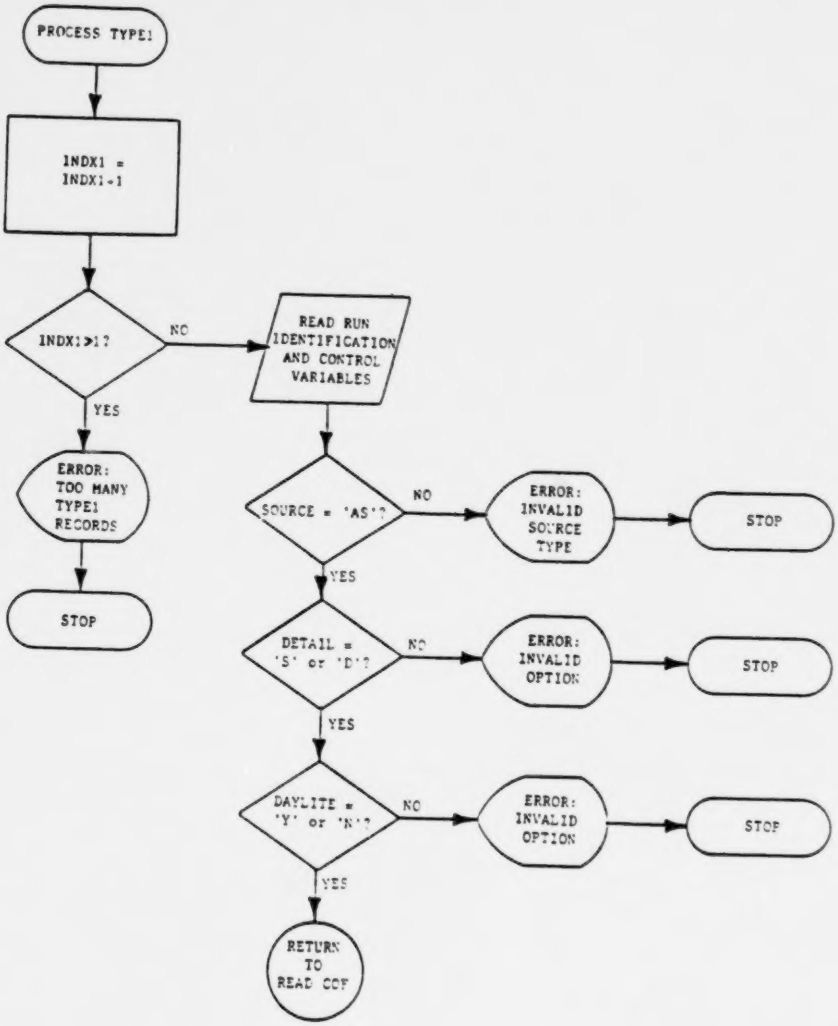
Page 1 of 11

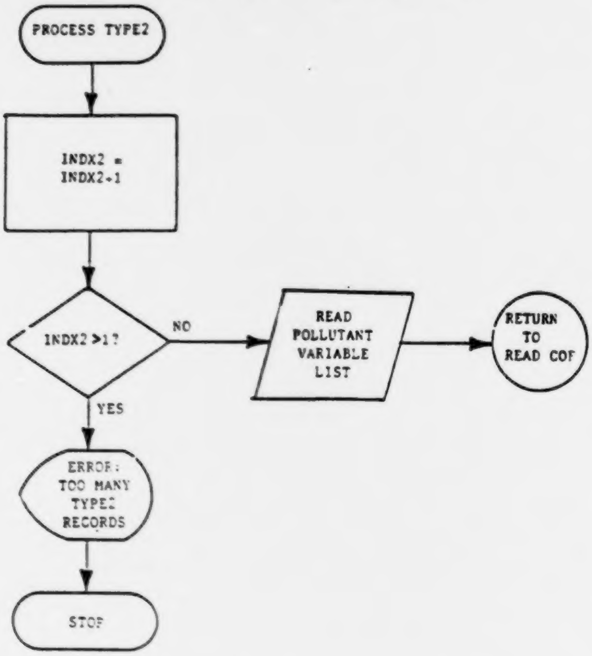

TAM-AS
TAM.SAS
READ CONTROL OPTIONS FILE
Read run identification, control variables and pollutant list, and create macro variables.
MACRO ASTAF
Read in Temporal Allocation Factor File and merge with Emissions File. Offset hourly data to GMT and output in EBCDIC.
ECHO CONTROL OPTIONS FILE
CREATE MACRO VARIABLES
MACRO DETAIL
Print report if specified.
SORT
Sort (IBM SYNCSORT) EBCDIC Emissions File by (column, row) or by (SCC, State, County), depending on emissions resolution specified in COF.
MTPREP.FORT
Multiply emissions by Temporal Allocation Factors.
MTPREP. SAS
Read temporally resolved EBCDIC emissions into SAS format.
STOP

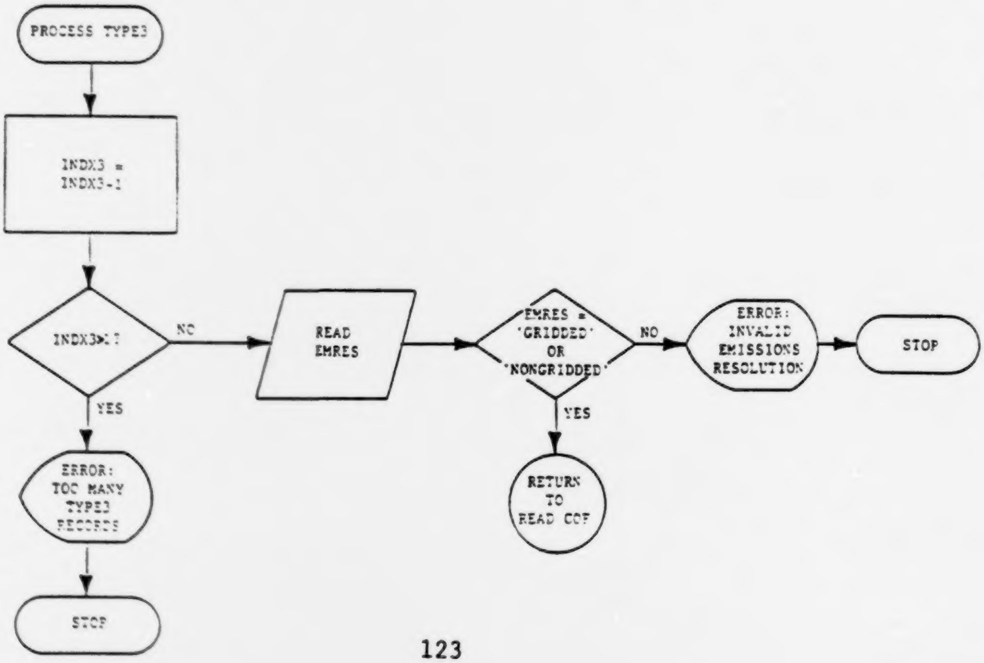
Temporal Allocation Module: Area Sources-- Page 2 of 11


READ CONTROL OPTIONS FILE
END OF FILE?
NO
YES
READ RECORD TYPE
*
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABLES
RETURN TO TAM
TYPE=1?
NO
YES
TYPE=2?
NO
YES
TYPE=3?
NO
YES
ERROR: INVALID RECORD TYPE
STOP
PROCESS TYPE1
PROCESS TYPE2
PROCESS TYPE3

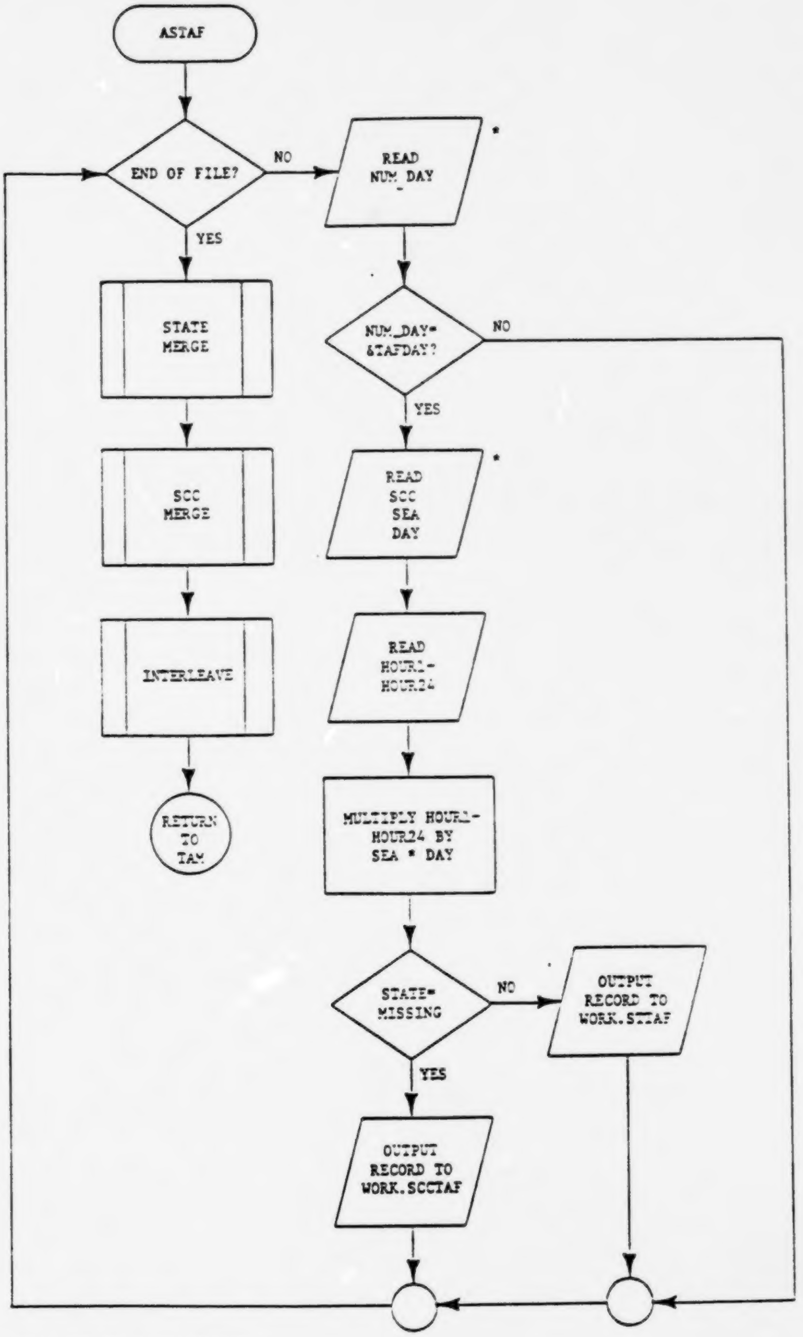
*DO NOT ADVANCE RECORD POINTER


PROCESS TYPE1
INDX1 = INDX1+1
INDX1>1?
NO
YES
READ RUN IDENTIFICATION AND CONTROL VARIABLES
ERROR: TOO MANY TYPE1 RECORDS
STOP
SOURCE = 'AS'?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES
DETAIL = 'S' or 'D'?
NO
ERROR: INVALID OPTION
STOP
YES
DAYLITE = 'Y' or 'N'?
NO
ERROR: INVALID OPTION
STOP
YES
RETURN TO READ CCF

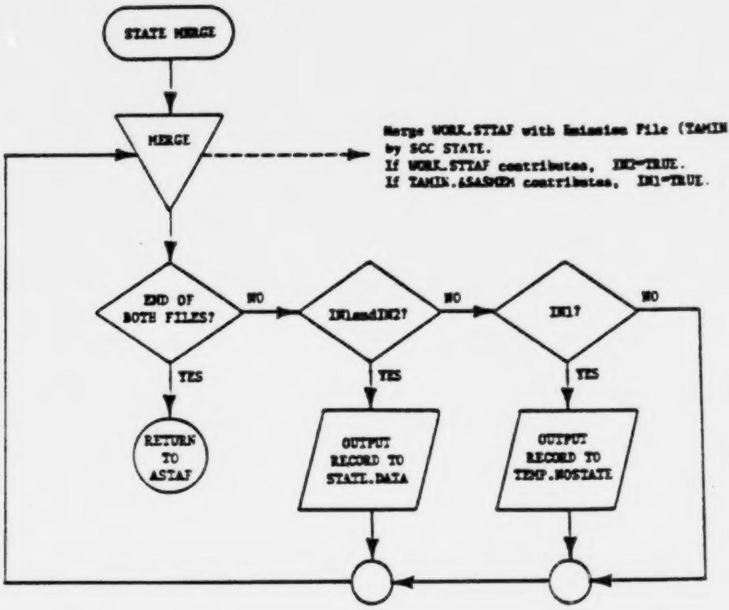

PROCESS TYPE2
INDX2 = INDX2+1
INDX2 >1?
NO
READ POLLUTANT VARIABLE LIST
RETURN TO READ COF
YES
ERROR: TOO MANY TYPE2 RECORDS
STOP


PROCESS TYPE3
INDX3 = INDX3+1
INDX3>1?
NO
READ EMRES
EMRES = 'GRIDDED' OR 'NONGRIDDED'
NO
ERROR: INVALID EMISSIONS RESOLUTION
STOP
YES
RETURN TO READ COF
YES
ERROR: TOO MANY TYPE3 RECORDS
STOP

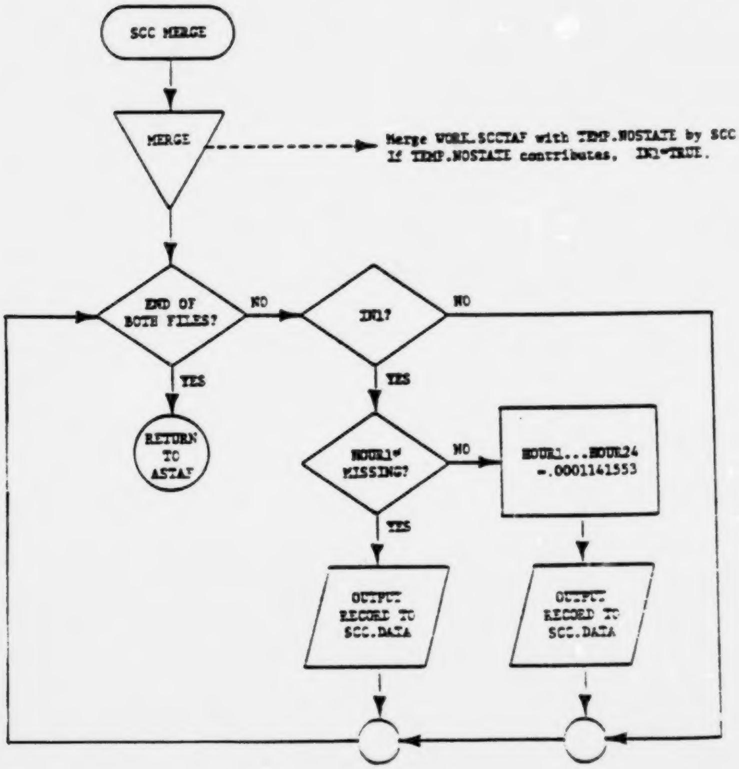
Temporal Allocation Module: Area Sources-- Page 5 of 11


ASTAF
END OF FILE?
NO
YES
READ NUM_DAY
*
STATE MERGE
NUM_DAY= &TAFDAY?
NO
YES
SCC MERGE
READ SCC SEA DAY
*
INTERLEAVE
READ HOUR1-HOUR24
RETURN TO TAM
MULTIPLY HOUR1-HOUR24 BY SEA * DAY
STATE= MISSING
NO
OUTPUT RECORD TO WORK.STTAF
YES
OUTPUT RECORD TO WORK.SCCTAF

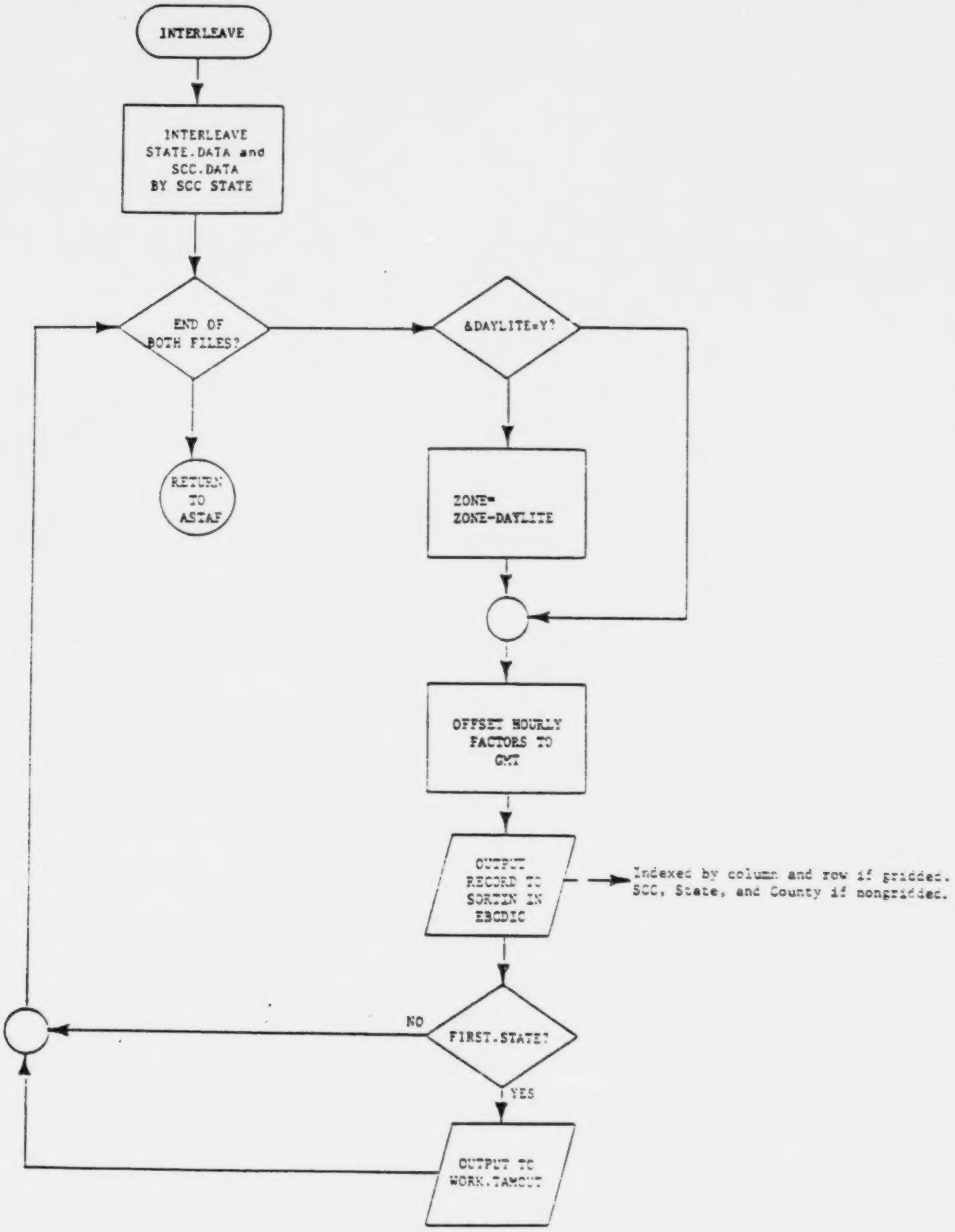
*DO NOT ADVANCE RECORD POINTER


STATE MERGE
MERGE
END OF BOTH FILES?
NO
IN1andIN2?
NO
IN1?
NO
YES
RETURN TO ASTAF
YES
OUTPUT RECORD TO STATE.DATA
YES
OUTPUT RECORD TO TEMP.NOSTATE

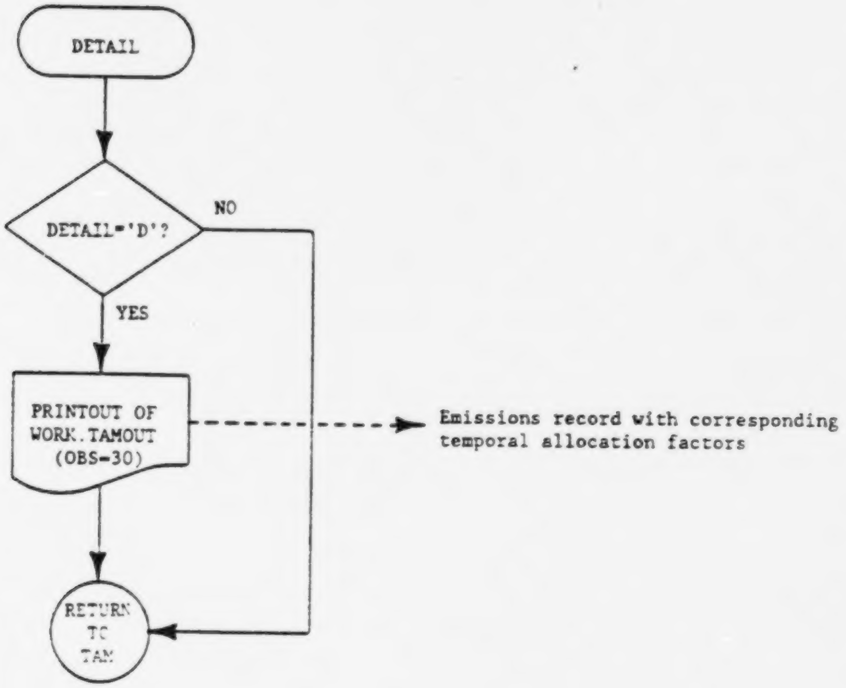
Merge WORK.STTAF with Emission File (TAMIN.&SASMEM)
by SCC STATE.
If WORK.STTAF contributes, IN2=TRUE.
If TAMIN.&SASMEM contributes, IN1=TRUE.


SCC MERGE
MERGE
END OF BOTH FILES?
NO
IN1?
NO
YES
RETURN TO ASTAF
YES
HOUR1= MISSING?
NO
HOUR1...HOUR24 =.0001141553
YES
OUTPUT RECORD TO SCC.DATA
OUTPUT RECORD TO SCC.DATA

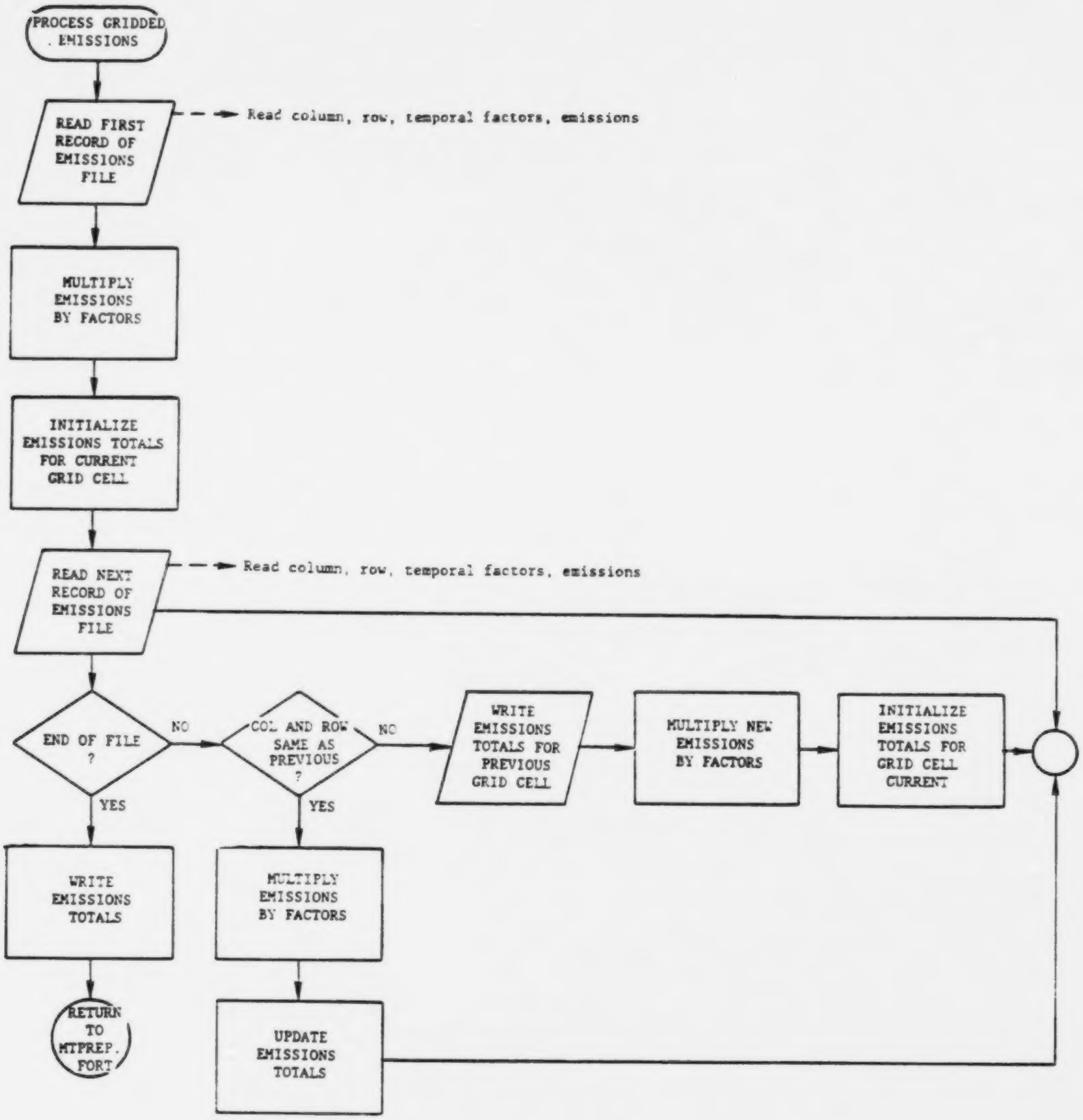
Merge WORK.SCCTAF with TEMP.NOSTATE by SCC.
If TEMP.NOSTATE contributes, IN1=TRUE.

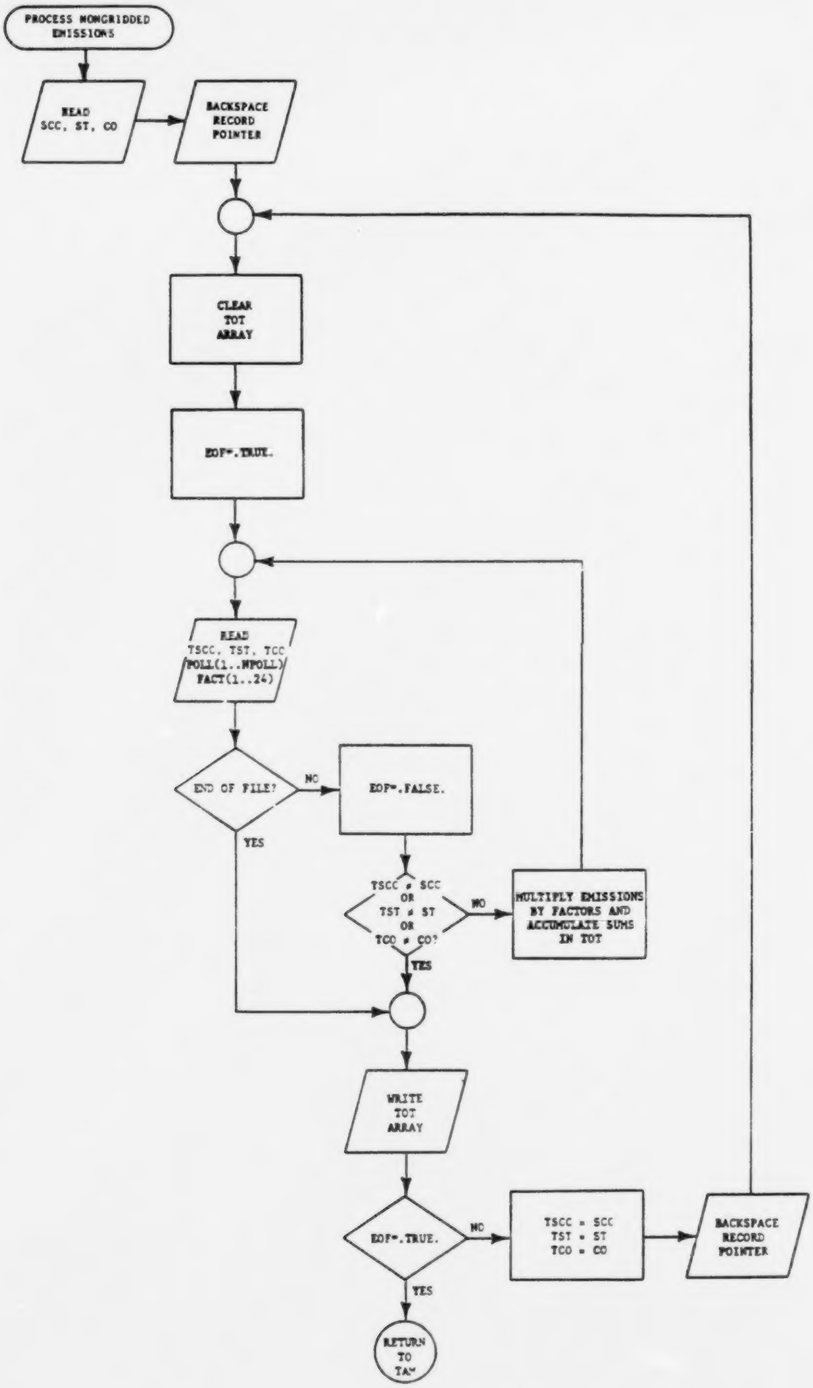

INTERLEAVE
INTERLEAVE STATE.DATA and SCC.DATA BY SCC STATE
END OF BOTH FILES?
RETURN TO ASTAF
&DAYLITE=Y?
ZONE= ZONE-DAYLITE
OFFSET HOURLY FACTORS TO GMT
OUTPUT RECORD TO SORTIN IN EBCDIC
Indexed by column and row if gridded.
SCC, State, and County if nongridded.
FIRST.STATE?
NO
YES
OUTPUT TO WORK.TAMOUT

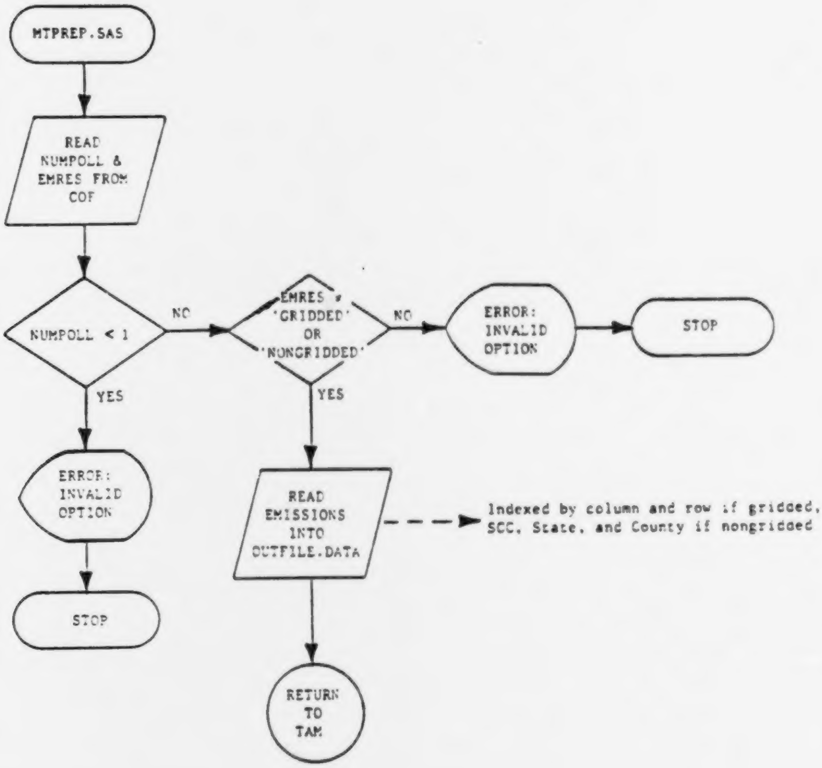
Temporal Allocation Module: Area Sources-- Page 8 of 11


DETAIL
DETAIL='D'?
NO
YES
PRINTOUT OF WORK.TAMOUT (OBS=30)
Emissions record with corresponding temporal allocation factors
RETURN TO TAM

Temporal Allocation Module: Area Sources-- Page 9 of 11


PROCESS GRIDDED EMISSIONS
READ FIRST RECORD OF EMISSIONS FILE
Read column, row, temporal factors, emissions
MULTIPLY EMISSIONS BY FACTORS
INITIALIZE EMISSIONS TOTALS FOR CURRENT GRID CELL
READ NEXT RECORD OF EMISSIONS FILE
Read column, row, temporal factors, emissions
END OF FILE ?
NO
YES
COL AND ROW SAME AS PREVIOUS ?
NO
YES
WRITE EMISSIONS TOTALS FOR PREVIOUS GRID CELL
MULTIPLY NEW EMISSIONS BY FACTORS
INITIALIZE EMISSIONS TOTALS FOR GRID CELL CURRENT
WRITE EMISSIONS TOTALS
MULTIPLY EMISSIONS BY FACTORS
RETURN TO MTPREP. FORT
UPDATE EMISSIONS TOTALS


PROCESS NONGRIDDED EMISSIONS
READ SCC, ST, CO
BACKSPACE RECORD POINTER
CLEAR TOT ARRAY
EOF=.TRUE.
READ TSCC, TST, TCC POLL(1..NPOLL) FACT(1..24)
END OF FILE?
NO
EOF=.FALSE.
YES
TSCC ≠ SCC OR TST ≠ ST OR TCO ≠ CO?
NO
MULTIPLY EMISSIONS BY FACTORS AND ACCUMULATE SUMS IN TOT
YES
WRITE TOT ARRAY
EOF=.TRUE.
NO
TSCC = SCC TST = ST TCO = CO
BACKSPACE RECORD POINTER
YES
RETURN TO TAM


MTPREP.SAS
READ NUMPOLL & EMRES FROM COF
NUMPOLL < 1
YES
ERROR: INVALID OPTION
STOP
NO
EMRES = 'GRIDDED' OR 'NONGRIDDED'
NO
ERROR: INVALID OPTION
STOP
YES
READ EMISSIONS INTO OUTFILE.DATA
Indexed by column and row if gridded, SCC, State, and County if nongridded
RETURN TO TAM

SPECIATION MODULE

Some of the NAPAP annual inventory pollutants represent composites of individual species, which require further resolution for modeling purposes. For the 1985 inventory, NO_x is divided into NO and NO_2, hydrocarbons are apportioned into up to 32 photochemical reactivity classes, and particulate matter is allocated into 15 splits based on alkalinity and size fraction.

The Speciation Module (SM) accepts SAS-formatted emissions files processed by one of the FREDS modules and merges them with speciation factors generated by the Pollutant Splits System (PSPLIT) and/or factors contained in a Speciation Factor File (SFF) (such as TSP alkalinity and size classes). The user has the flexibility to speciate any of the major pollutant categories since factors are generated and input peripherally. Currently, PSPLIT has the capability to speciate hydrocarbons by photochemical reactivity and split NO_x into NO and NO_2. Speciation of other pollutants may be accomplished by merging pollutant subclass speciation factors with emissions, via the SFF. The limiting factor is the availability of species profiles for other hydrocarbon classification schemes, TSP profiles, and other pollutant profiles to be used for speciation.

SM enables speciation of any of the input pollutants into subspecies classifications by providing a means to match merge the factors. The Control Options File enables user designation of the input pollutants to be speciated. Once the control file has been read in, macro variables are created to process the correct major pollutant categories and subspecies in each. The PSPLIT file contains pollutant classes and mole factors for THC, and percentage splits for NO_x. The SFF allows the user to input fractions for species not resolved in PSPLIT (e.g., alkalinity and size classes for TSP). Major pollutants speciated using PSPLIT may be apportioned into as many as 32 species or groups of species; pollutants speciated using SFF may be divided into up to 20 groups.

Speciation is accomplished for point and area source pollutants by merging the appropriate series of fractional multipliers in the pollutant splits file with the emissions files. The combined species file is merged with the emissions file as follows. Species allocation factors are matched to emissions records on the basis of SCC and pollutant SAROAD code. SM reads an emissions record and, based on SCC, finds the appropriate set of species allocation factors in the merged pollutant splits file. Each SCC's subset of allocation factors are identified by the SAROAD code for the pollutant to which they apply. SM then merges the appropriate allocation factors with the emissions record. If an SCC is encountered for which no speciation pattern exists, the emission record is output to an orphan file for later analysis.

In addition to the above actions, time zone data are applied to area source emissions records. This is performed in SM rather than TAM in order to reduce TAM execution time.

Diagnostic reports for SM include, at a minimum, a listing of control options, summary statistics relating to speciation, and a printout of orphan emissions records. Detailed reports contain a sample of output emission records for analysis. For area sources, a third report option will print, in addition to summary information, annual totals of speciated components in the output file.

Flow Chart and Description

The program flow for the point and area source versions of the SM are illustrated in the following flow charts. An individual "set" of flow charts is presented for point and area sources. The first diagram of each set represents the overall module flow. Processes depicted by double vertical lines indicate the presence of several subprocesses, and hence a second level of more detailed diagrams are presented for these. For example, the first double-lined process is "READ CONTROL OPTIONS FILE". Starting on the next page, the reader will find a second-level chart with the same name. On completion of the second level of subprocesses, the user returns to the first level. The user would then continue on the first level until the next double-lined process is encountered - "MACRO SFFIN". Again, the reader refers to a second level diagram. This continues until the reader has encountered all processes depicted on the main module flow chart. If a second level process contains a double-lined process box, this refers to a third level subprocess. The user must return to the second level and, when completed, return to the first level to continue.

For both point and area sources, SM first reads the Control Options File (COF) for speciation into a SAS data set and validates the user selected options. This file contains information for source type, identification of pollutants to speciate, number of subspecies classes, a run identification header, and a report diagnostics flag. The area source COF also contains a variable consisting of two flags which control the input of PSPLIT and/or SFF data depending on whether or not area sources are processed as split files. The SYMPUT macro function is called to create SAS macro variables to process the requested pollutant categories and subspecies in each.

For point source runs, SFFIN serves as an input subroutine, reading the Speciation Factor File (SFF) into a temporary SAS data set, merging the SFF with the Control Options File and assigning pollutant categories. This file is output to another temporary data set and sorted by SCC. The program returns to the main body of SM, reads in the PSPLIT file and sorts by SCC. PSPMER is invoked next by the main program to merge the PSPLIT output file and the Speciation Factor File, creating a pollutant splits file. This allows for speciation of PSPLIT pollutants (THC and NO_x) in addition to those not resolved by PSPLIT. SORTMER, the next processing macro invoked for point sources, merges the point source emissions file with the pollutant splits file created in PSPMER and outputs the emission records and merged speciation factors. A diagnostic report is printed including a listing of the Control Options File and the SAROAD and number of subclasses for the major pollutants being speciated. If a detailed report was specified, SM also points a sample of the output emissions (e.g., 50 records) file including the speciation factors appended to the emission records.

In order to allow for processing of area source emissions files divided by pollutant (e.g., THC/NO_x and TSP/SO_2), the PSPLIT and SFF input routines are coded as separate macros (PSPIN and SFFIN) in the area source Speciation Module. The execution of the macros PSPIN and SFFIN is controlled by the variable SFFLG in the Control Options File. This variable consists of two elements, or flags, each of which can be set as "Y" or "N". The first controls PSPLIT and the second controls SFF. If the input file is a THC/NO_x file, the flags are set as "YN", indicating that only a PSPLIT file is to be input and merged. Similarly, a setting of "NY" indicates only factors from the SFF are to be input; "YY" indicates a complete file requiring speciation from both PSPLIT and SFF. As a result, the macro PSPIN is invoked only when the first flag is set to "Y", and SFFIN only when the second flag is "Y". Both PSPIN and SFFIN read their respective files into temporary SAS data sets, sort by SCC, and calculate start and end points for array indices.

PSPMER is invoked next to merge the PSPLIT and Speciation Factor Files, if both exist, to create a pollutant splits file similar to point source processing. Class SAROAD codes from this merge are output for inclusion in the diagnostic report. The TIMEZONE macro is then invoked to input and sort data in the Time Zone File (TZF) by State and County. The TZF is then merged with the area source emissions file, output to a SAS data set, and resorted by SCC, State, and County. (For point sources, this is accomplished in the Temporal Allocation Module). Area source processing is completed by the SORTMER macro which merges the emissions file previously output by TIMEZONE with the pollutant splits file created in PSPMER. SORTMER also multiplies emissions by the speciation factors and outputs a speciated emissions file for further FREDS processing.

Once area source processing is complete, a diagnostic report is printed including a listing of the Control Options File, SAROAD codes for subspecies, and emission records with no speciation profiles. In addition, emission records with no time zone data are printed for area sources. A subsetted printout of speciated emission records (the first 200 observations) may be requested by selecting the detailed report option. Annual totals of speciated area source emissions may also be requested in the COF.

Peripheral Software

The speciation requirement for hydrocarbon emissions can change depending on the modeling chemistry used in a particular application of an emissions data set. Therefore, it was decided during the development of the NECRMP Inventory in the early 1980s (the speciation methodology adapted for NAPAP) to make hydrocarbon speciation as flexible as possible. This objective was achieved by creating an independent program called the Pollutant Splits System (PSPLIT) to compute factors which can be used to disaggregate hydrocarbon emissions into selected groups of compounds.

PSPLIT was developed by EPA/ASRL (currently AREAL) to automate a method for generating hydrocarbon speciation factors for any specified chemistry mechanism or species classification scheme. It also provides an effective means of incorporating revised species profiles for each source type. PSPLIT is a Fortran program that can divide hydrocarbon emissions into over 600 discrete species based on Source Classification Code (SCC) specific profiles. The individual species are subsequently reaggregated into up to 32 classes based on the requirements of the selected transport model.

Three data files are required as input to PSPLIT. The Species-Profile file contains the weight percent contribution of each species to each profile. Each individual species is assigned to a reactivitiy class in the Species-Class file. Finally, profiles are matched to NAPAP emissions records using the SCC-Profile Index file. PSPLIT performs the appropriate processing steps to calculate the amount of total hydrocarbon that contributes to each class, for every source category in the inventory. The resulting mole factors are expressed in moles/kilogram; when multiplied by the mass of total hydrocarbon from a source, they yield the number of moles of each class emitted.

PSLIT is also used to disaggregate NO_x emisssions into NO and NO_2 components. The species profiles input to PSPLIT contain the weight fractions of NO and NO_2, which are carried through the program and become the speciation factors for these two components.

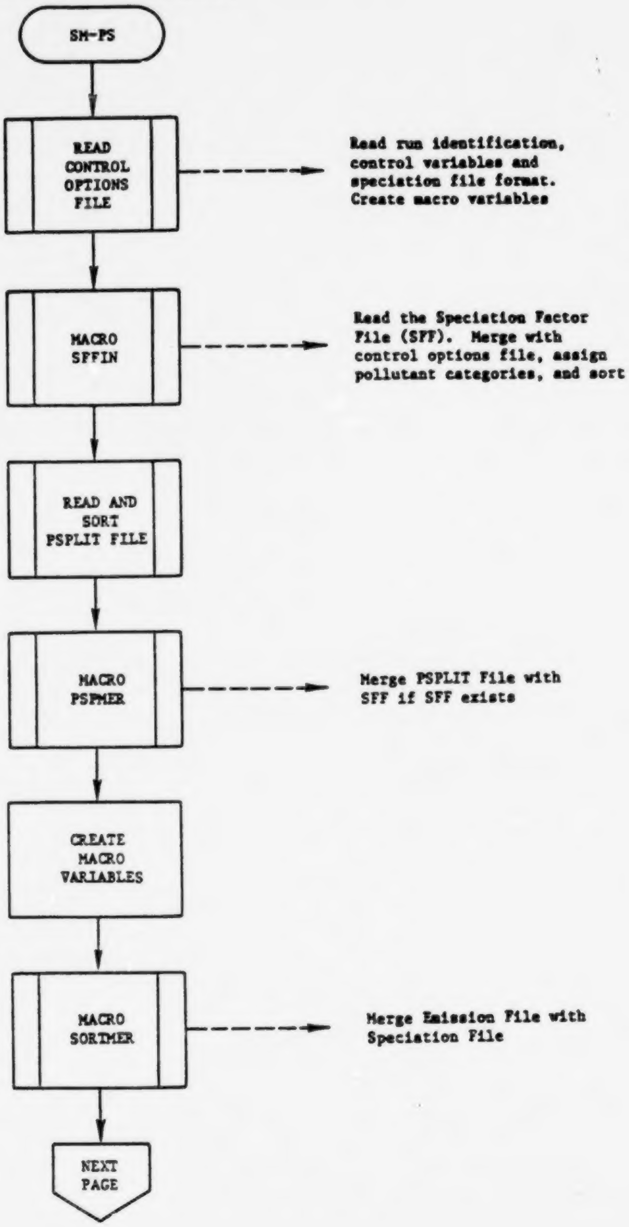
The data processing requirements of the 1985 inventory made it necesary to revise the original PSPLIT computer code. This effort resulted in the creation of a new version of the program designated PSPLIT_2A. The new version differs from earlier versions as follows:

- The maximum allowable number of species per profile was increased from 75 to 325;
- The maximum allowable number of species in all classes was increased from 500 to 640;
- The maximum allowable number of SCC - Profile index records was increased from 1,800 to 4,000;
- The maximum allowable number of profiles was increased from 175 to 320;

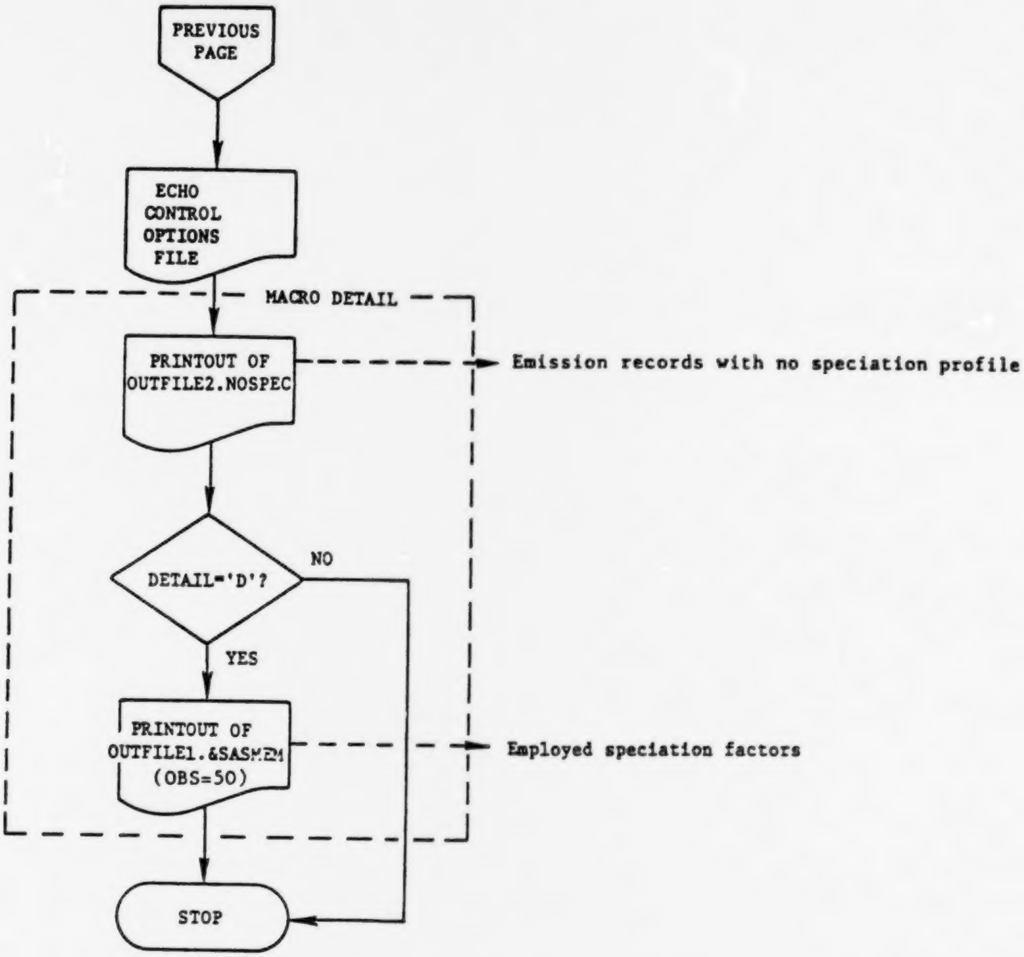
- The maximum allowable number of species-level profile records was increased from 2,000 to 4,500; and
- The maximum allowable number of species classes was increased from 30 to 32.

In addition, the format of the output speciation factors was increased from four digits to five digits to increase the precision of species emission estimates.

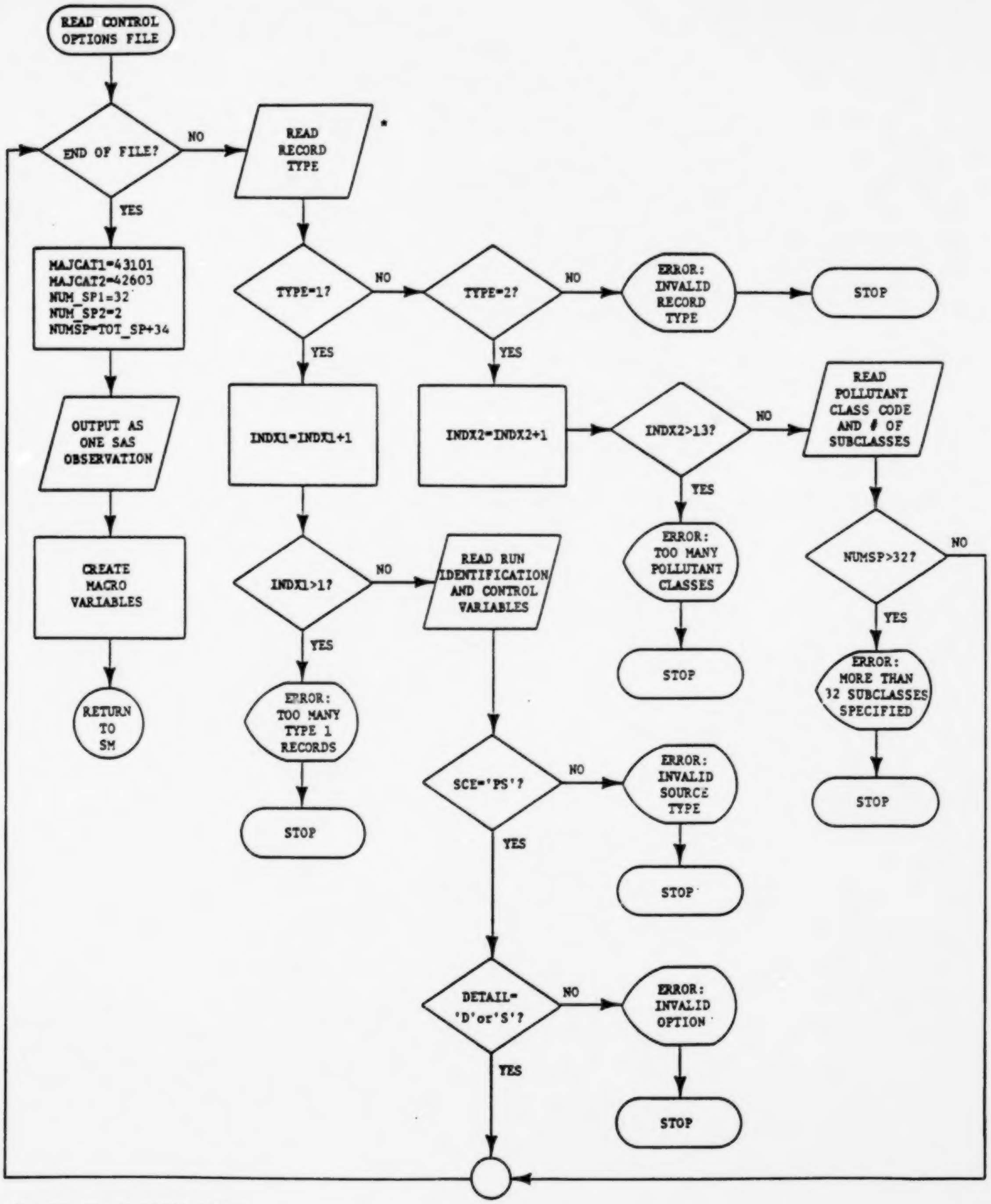
Speciation Module: Point Sources-- Page 1 of 8


SM-PS
READ CONTROL OPTIONS FILE
Read run identification, control variables and speciation file format. Create macro variables
MACRO SFFIN
Read the Speciation Factor File (SFF). Merge with control options file, assign pollutant categories, and sort
READ AND SORT PSPLIT FILE
MACRO PSPMER
Merge PSPLIT File with SFF if SFF exists
CREATE MACRO VARIABLES
MACRO SORTMER
Merge Emission File with Speciation File
NEXT PAGE

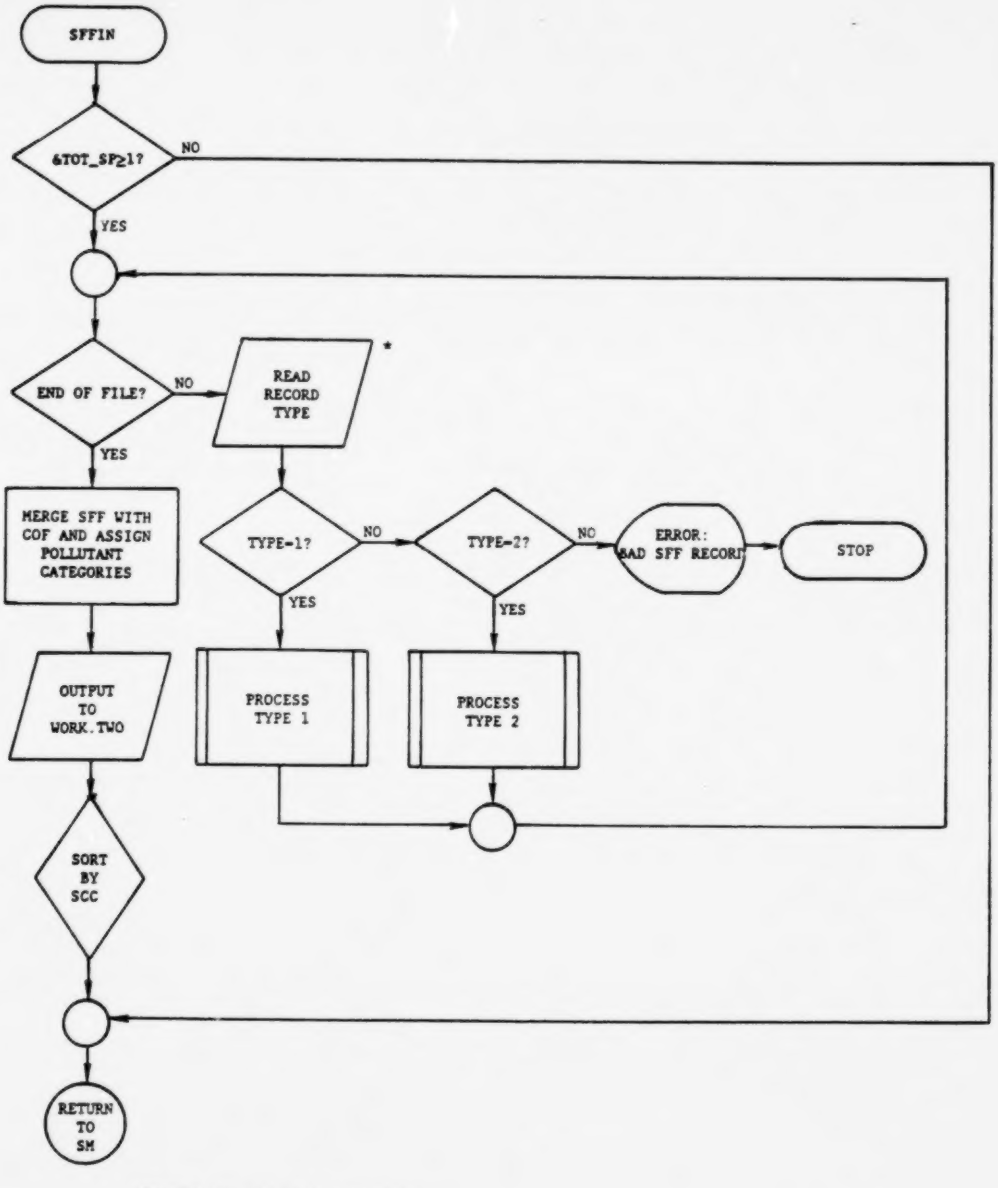
Speciation Module: Point Sources--


PREVIOUS PAGE
ECHO CONTROL OPTIONS FILE
MACRO DETAIL
PRINTOUT OF OUTFILE2.NOSPEC
Emission records with no speciation profile
DETAIL='D'?
NO
YES
PRINTOUT OF OUTFILE1.&SASMEM (OBS=50)
Employed speciation factors
STOP

Speciation Module: Point Sources--

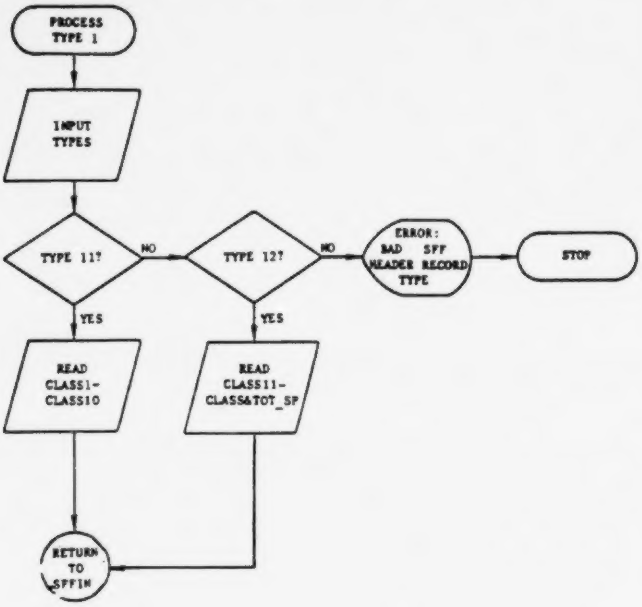

READ CONTROL OPTIONS FILE
END OF FILE?
NO
YES
READ RECORD TYPE
*
MAJCAT1=43101
MAJCAT2=42603
NUM_SP1=32
NUM_SP2=2
NUMSP=TOT_SP+34
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABLES
RETURN TO SM
TYPE=1?
NO
YES
TYPE=2?
NO
YES
ERROR: INVALID RECORD TYPE
STOP
INDX1=INDX1+1
INDX2=INDX2+1
INDX2>13?
NO
YES
READ POLLUTANT CLASS CODE AND # OF SUBCLASSES
INDX1>1?
NO
YES
READ RUN IDENTIFICATION AND CONTROL VARIABLES
ERROR: TOO MANY POLLUTANT CLASSES
STOP
NUMSP>32?
NO
YES
ERROR: MORE THAN 32 SUBCLASSES SPECIFIED
STOP
ERROR: TOO MANY TYPE 1 RECORDS
STOP
SCE='PS'?
NO
YES
ERROR: INVALID SOURCE TYPE
STOP
DETAIL='D'or'S'?
NO
YES
ERROR: INVALID OPTION
STOP

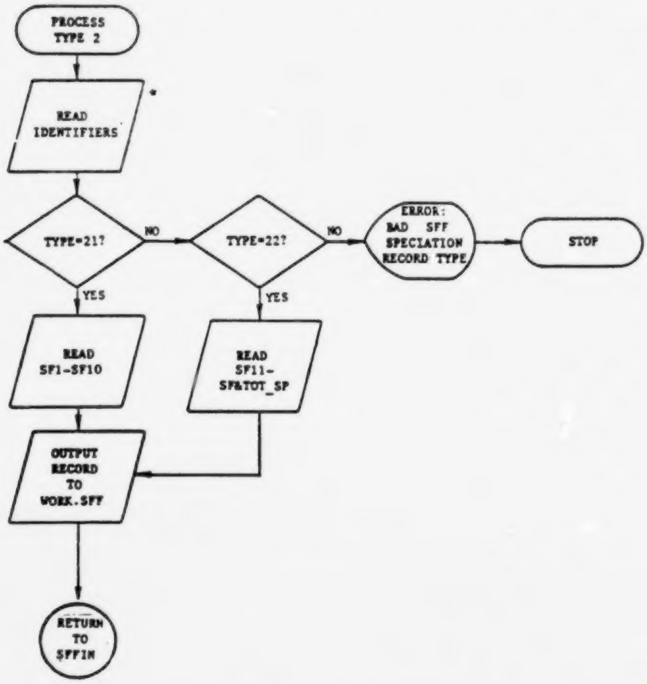
*DO NOT ADVANCE RECORD POINTER


SFFIN
&TOT_SF≥1?
NO
YES
END OF FILE?
NO
READ RECORD TYPE
*
YES
MERGE SFF WITH COF AND ASSIGN POLLUTANT CATEGORIES
TYPE-1?
NO
TYPE-2?
NO
ERROR: BAD SFF RECOR
STOP
YES
YES
OUTPUT TO WORK.TWO
PROCESS TYPE 1
PROCESS TYPE 2
SORT BY SCC
RETURN TO SM

*DO NOT ADVANCE RECORD POINTER

Speciation Module: Point Sources--

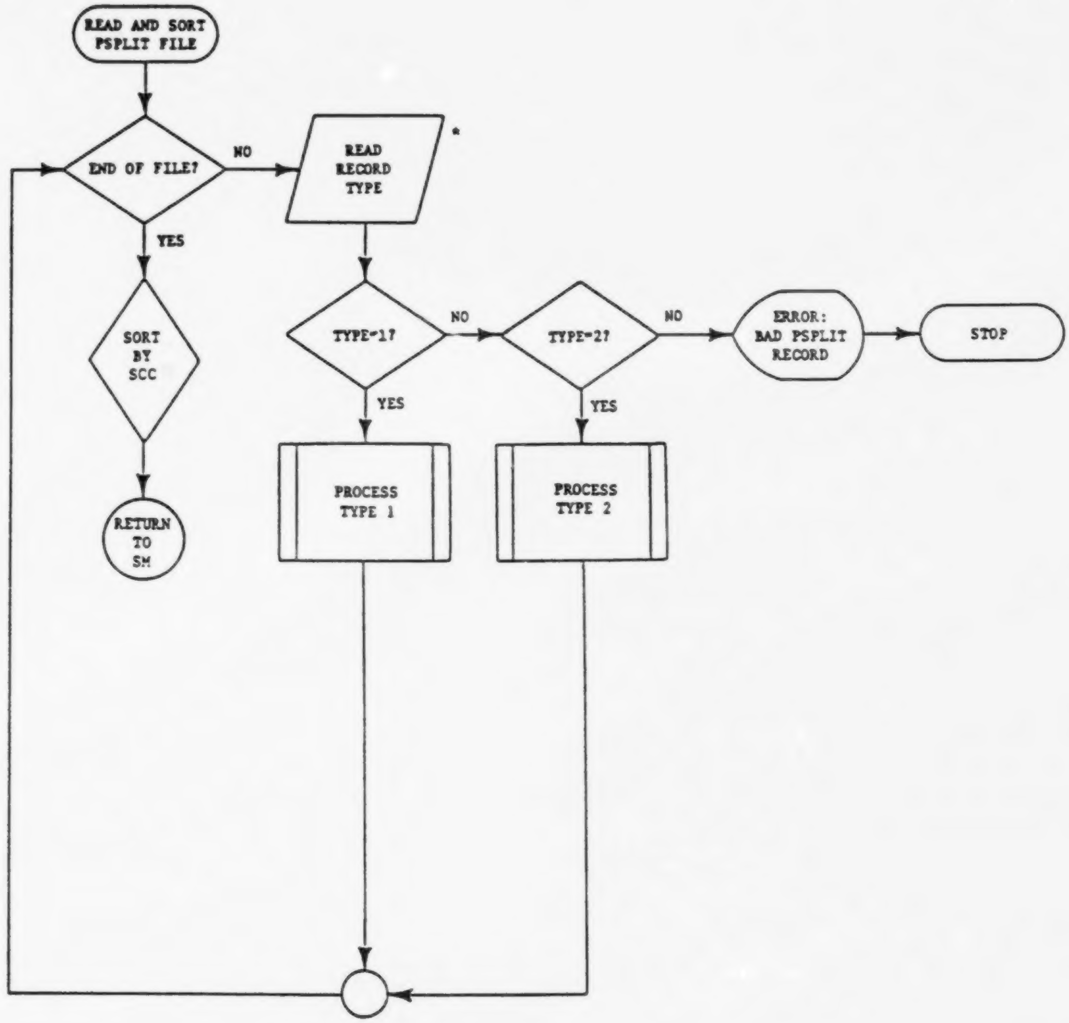

PROCESS TYPE 1
INPUT TYPES
TYPE 11?
NO
TYPE 12?
NO
ERROR: BAD SFF HEADER RECORD TYPE
STOP
YES
YES
READ CLASS1-CLASS10
READ CLASS11-CLASS&TOT_SP
RETURN TO SFFIN


PROCESS TYPE 2
READ IDENTIFIERS
*
TYPE=21?
NO
TYPE=22?
NO
ERROR: BAD SFF SPECIATION RECORD TYPE
STOP
YES
YES
READ SF1-SF10
READ SF11-SF&TOT_SP
OUTPUT RECORD TO WORK.SFF
RETURN TO SFFIN

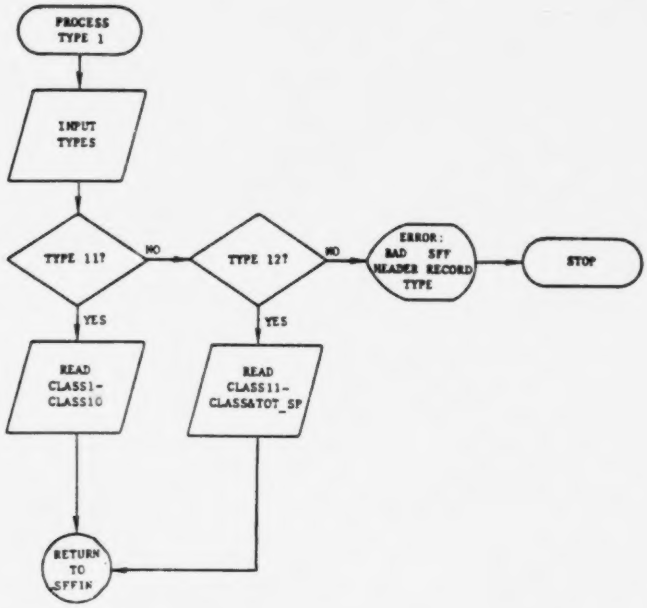
---

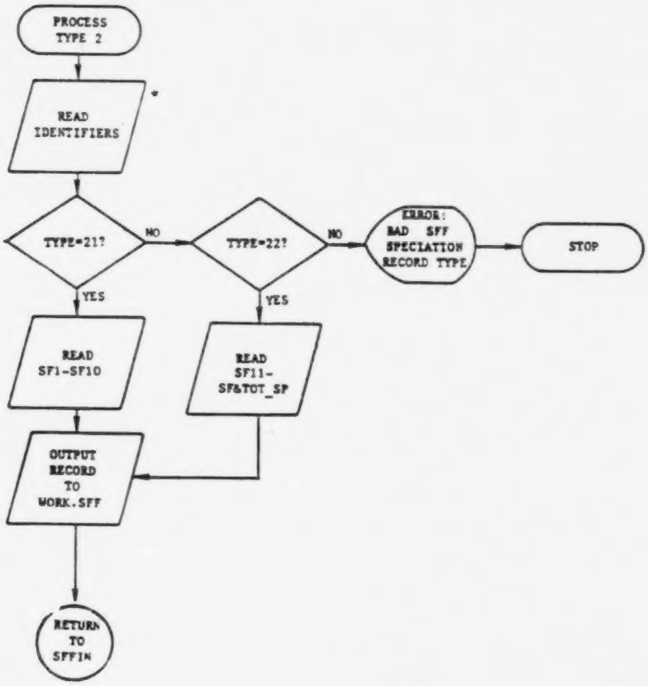
* DO NOT ADVANCE RECORD POINTER

Speciation Module: Point Sources-- Page 6 of 8

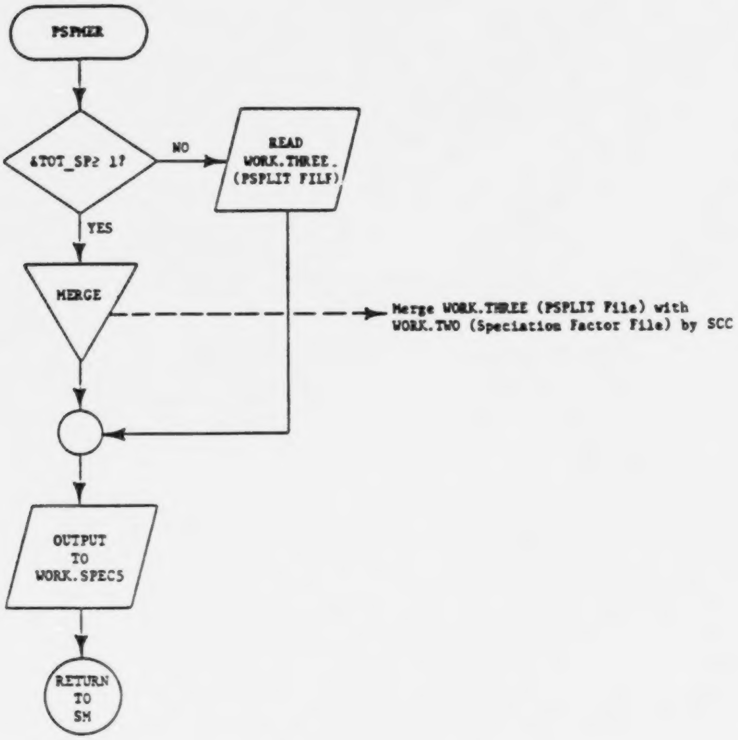

READ AND SORT PSPLIT FILE
END OF FILE?
NO
YES
READ RECORD TYPE
*
SORT BY SCC
RETURN TO SM
TYPE=1?
NO
YES
TYPE=2?
NO
YES
ERROR: BAD PSPLIT RECORD
STOP
PROCESS TYPE 1
PROCESS TYPE 2

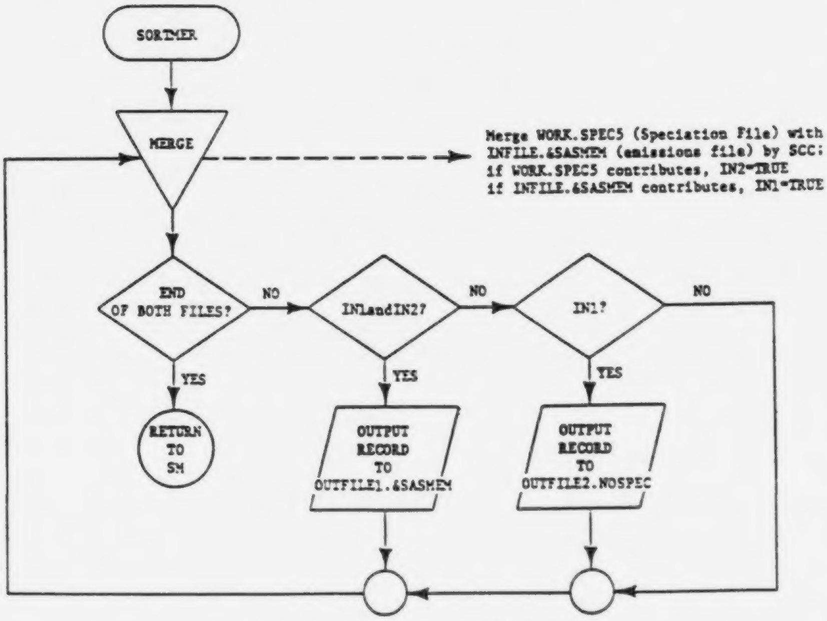
*DO NOT ADVANCE RECORD POINTER


PROCESS TYPE 1
INPUT TYPES
TYPE 11?
NO
TYPE 12?
NO
ERROR: BAD SFF HEADER RECORD TYPE
STOP
YES
READ CLASS1-CLASS10
YES
READ CLASS11-CLASS&TOT_SP
RETURN TO SFFIN

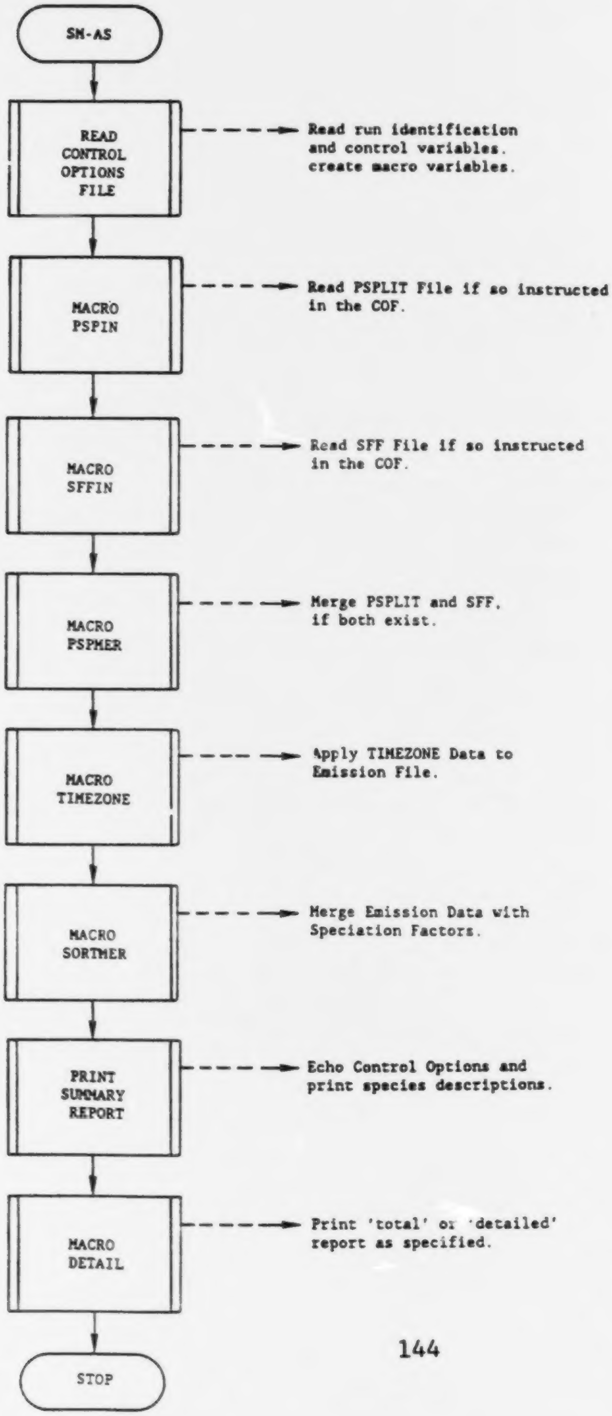

PROCESS TYPE 2
READ IDENTIFIERS
*
TYPE=21?
NO
TYPE=22?
NO
ERROR: BAD SFF SPECIATION RECORD TYPE
STOP
YES
READ SF1-SF10
YES
READ SF11-SF&TOT_SP
OUTPUT RECORD TO WORK.SFF
RETURN TO SFFIN

* DO NOT ADVANCE RECORD POINTER


PSPMER
&TOT_SP≥ 1?
NO
READ WORK.THREE. (PSPLIT FILF)
YES
MERGE
Merge WORK.THREE (PSPLIT File) with WORK.TWO (Speciation Factor File) by SCC
OUTPUT TO WORK.SPEC5
RETURN TO SM


SORTMER
MERGE
Merge WORK.SPEC5 (Speciation File) with INFILE.&SASMEM (emissions file) by SCC;
if WORK.SPEC5 contributes, IN2=TRUE
if INFILE.&SASMEM contributes, IN1=TRUE
END OF BOTH FILES?
NO
YES
RETURN TO SM
IN1andIN2?
NO
YES
OUTPUT RECORD TO OUTFILE1.&SASMEM
IN1?
NO
YES
OUTPUT RECORD TO OUTFILE2.NOSPEC

Speciation Module: Area Sources-- Page 1 of 17


SN-AS
READ CONTROL OPTIONS FILE
MACRO PSPIN
MACRO SFFIN
MACRO PSPMER
MACRO TIMEZONE
MACRO SORTMER
PRINT SUMMARY REPORT
MACRO DETAIL
STOP

Read run identification and control variables. create macro variables.

Read PSPLIT File if so instructed in the COF.

Read SFF File if so instructed in the COF.

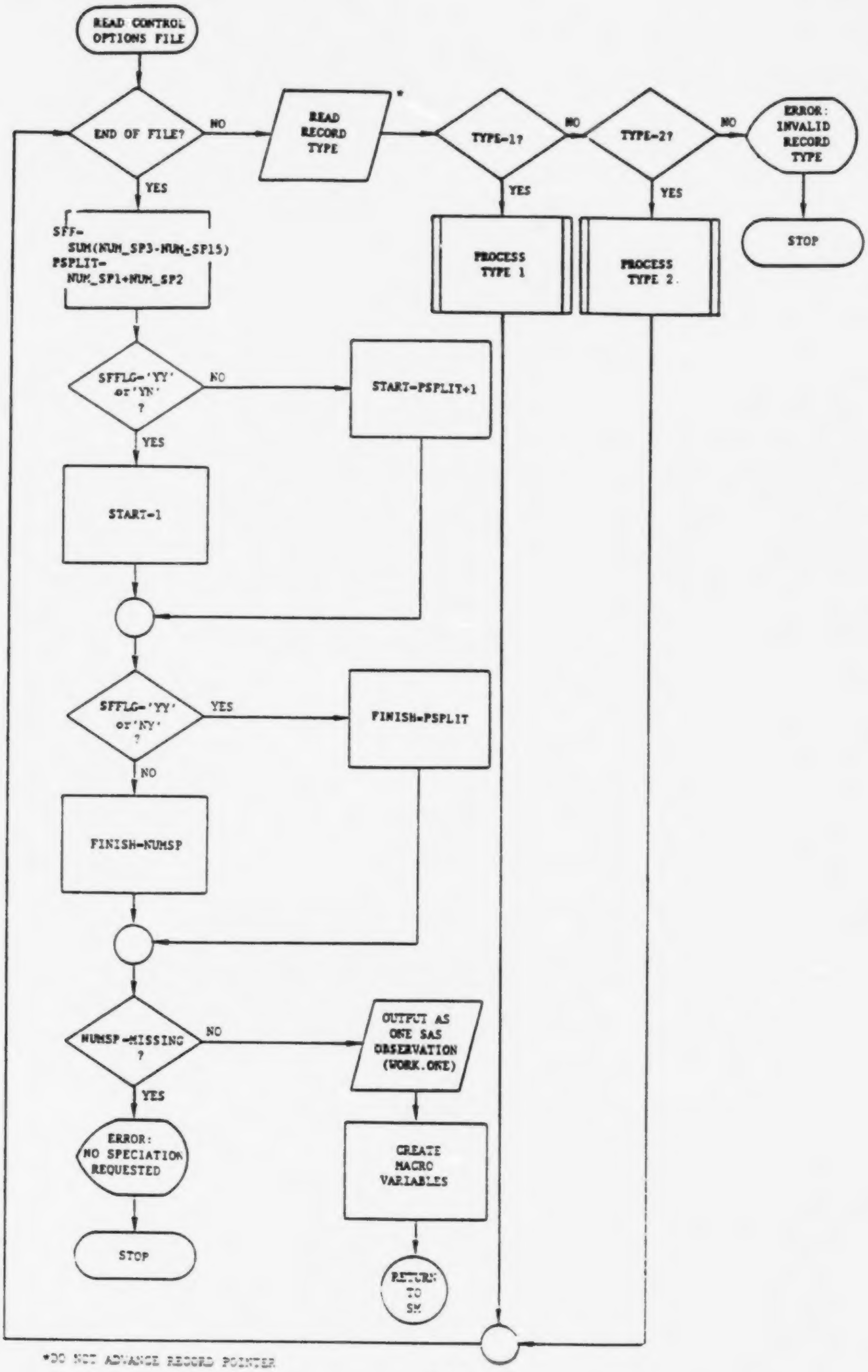
Merge PSPLIT and SFF, if both exist.

Apply TIMEZONE Data to Emission File.

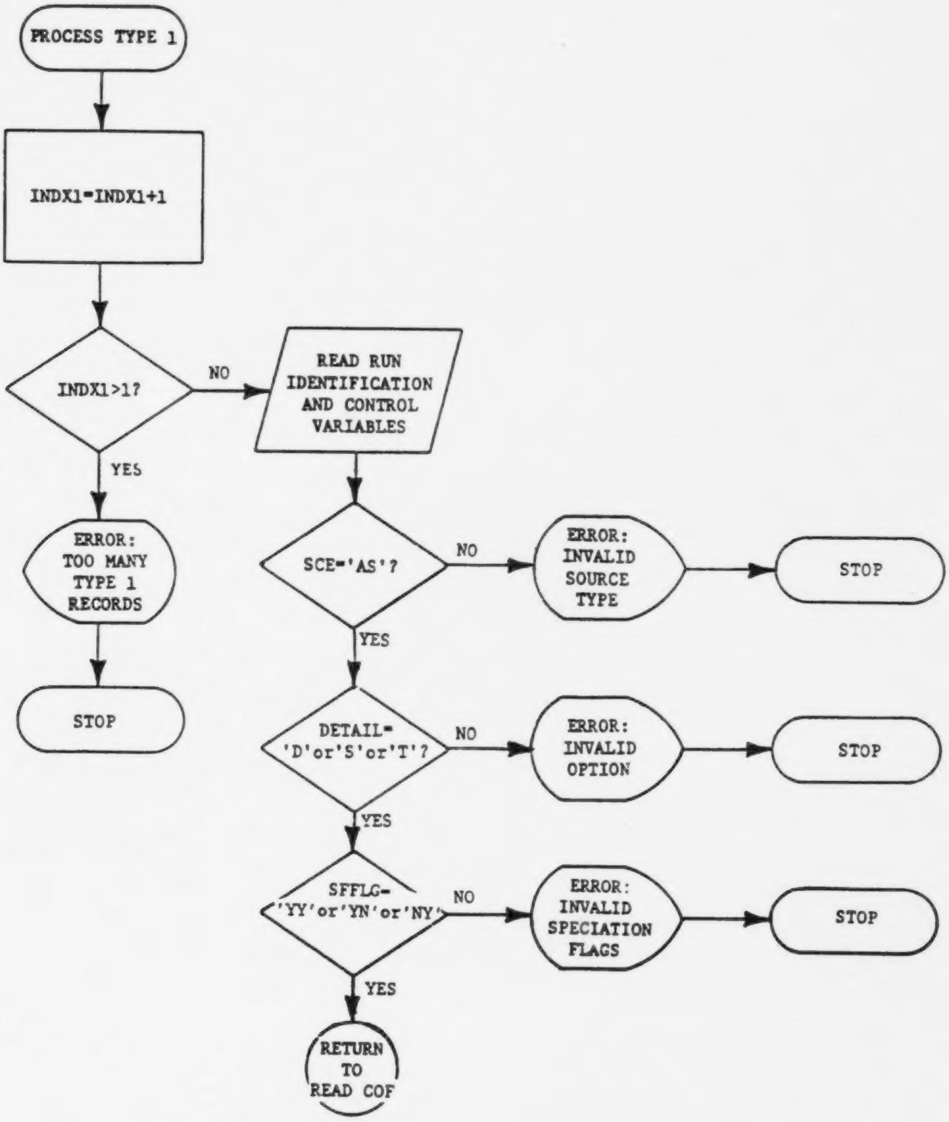
Merge Emission Data with Speciation Factors.

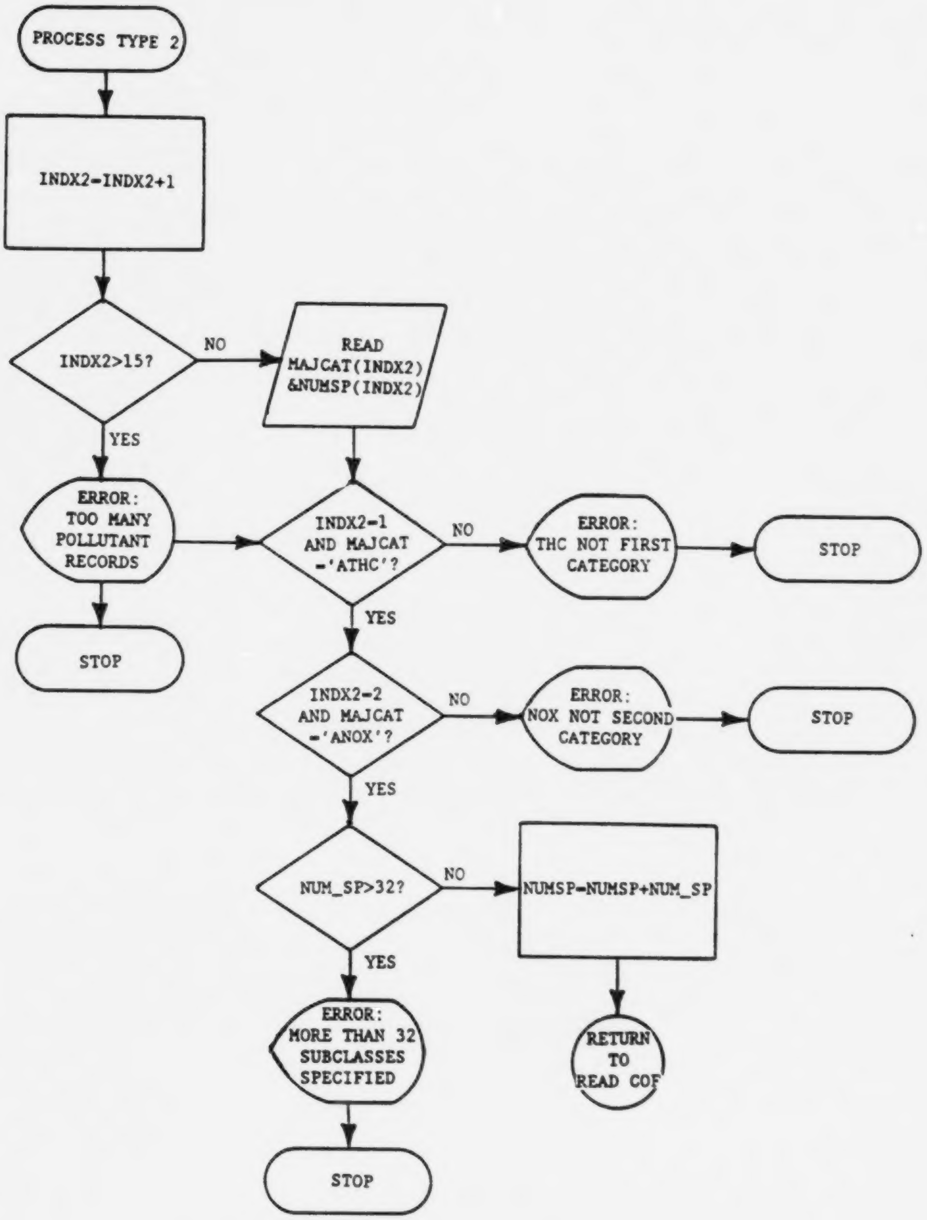
Echo Control Options and print species descriptions.

Print 'total' or 'detailed' report as specified.

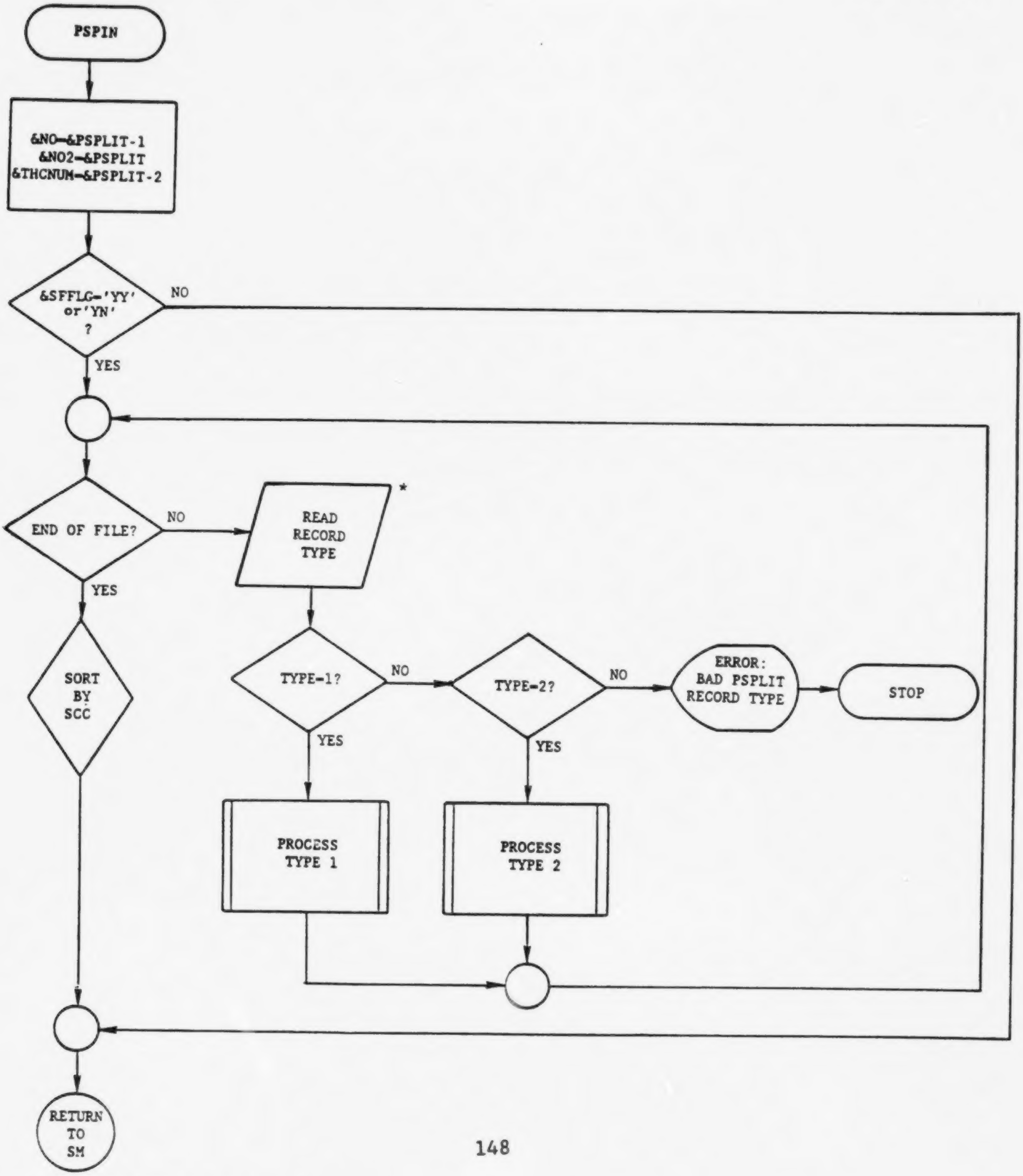

READ CONTROL OPTIONS FILE
END OF FILE?
NO
READ RECORD TYPE
*
TYPE=1?
NO
TYPE=2?
NO
ERROR: INVALID RECORD TYPE
STOP
YES
PROCESS TYPE 1
YES
PROCESS TYPE 2
YES
SFF=
SUM(NUM_SP3-NUM_SP15)
PSPLIT=
NUM_SP1+NUM_SP2
SFFLG='YY' or 'YN' ?
NO
START=PSPLIT+1
YES
START=1
SFFLG='YY' or 'NY' ?
YES
FINISH=PSPLIT
NO
FINISH=NUMSP
NUMSP=MISSING ?
NO
OUTPUT AS ONE SAS OBSERVATION (WORK.ONE)
YES
ERROR: NO SPECIATION REQUESTED
CREATE MACRO VARIABLES
STOP
RETURN TO SM

*DO NOT ADVANCE RECORD POINTER

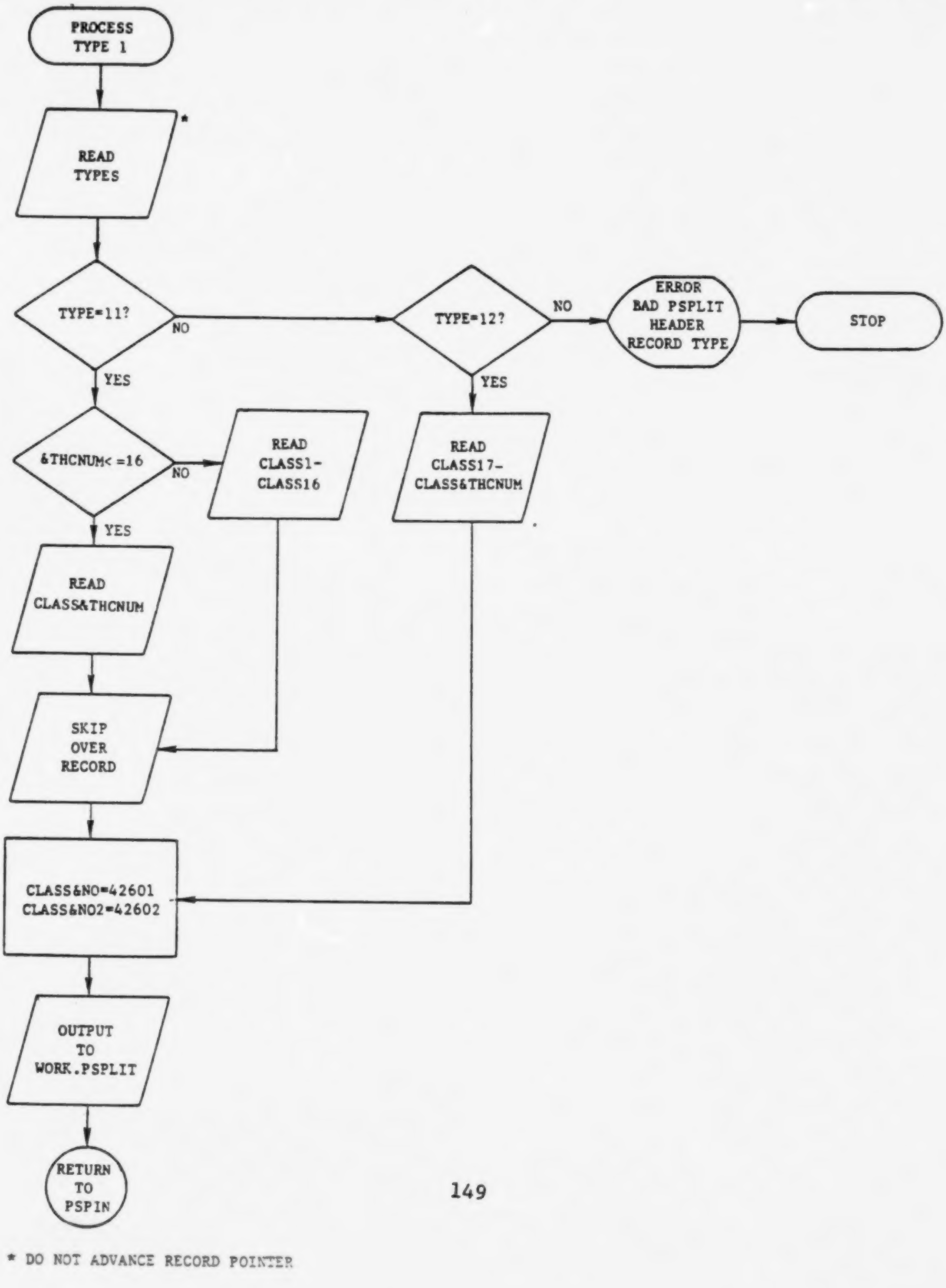

PROCESS TYPE 1
INDX1=INDX1+1
INDX1>1?
NO
YES
READ RUN IDENTIFICATION AND CONTROL VARIABLES
ERROR: TOO MANY TYPE 1 RECORDS
STOP
SCE='AS'?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES
DETAIL='D'or'S'or'T'?
NO
ERROR: INVALID OPTION
STOP
YES
SFFLG='YY'or'YN'or'NY'
NO
ERROR: INVALID SPECIATION FLAGS
STOP
YES
RETURN TO READ COF


PROCESS TYPE 2
INDX2=INDX2+1
INDX2>15?
NO
YES
READ MAJCAT(INDX2) &NUMSP(INDX2)
ERROR: TOO MANY POLLUTANT RECORDS
STOP
INDX2=1 AND MAJCAT ='ATHC'?
NO
YES
ERROR: THC NOT FIRST CATEGORY
STOP
INDX2=2 AND MAJCAT ='ANOX'?
NO
YES
ERROR: NOX NOT SECOND CATEGORY
STOP
NUM_SP>32?
NO
YES
NUMSP=NUMSP+NUM_SP
RETURN TO READ COF
ERROR: MORE THAN 32 SUBCLASSES SPECIFIED
STOP

Speciation Module: Area Sources-- Page 5 of 17

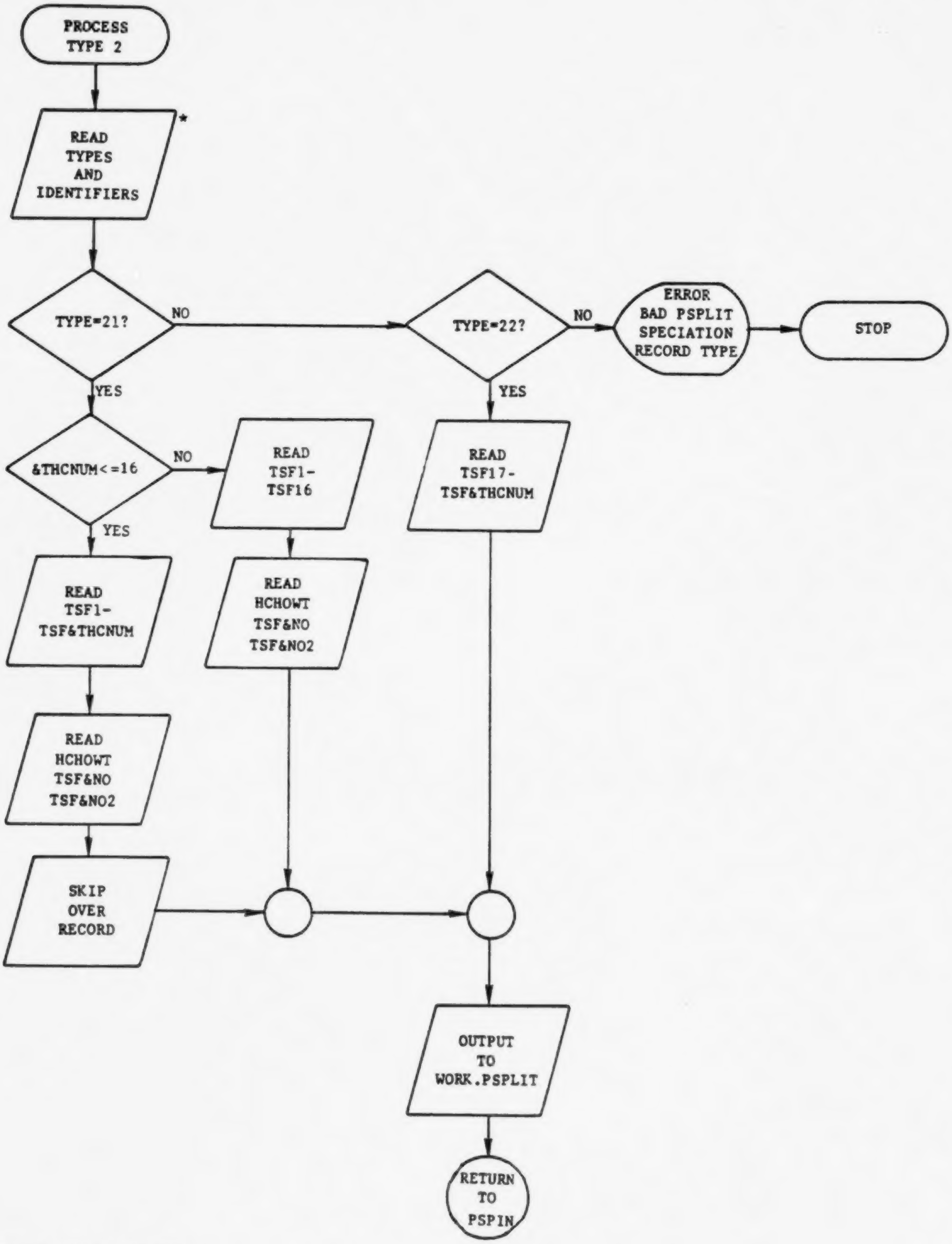

PSPIN
&NO=&PSPLIT-1
&NO2=&PSPLIT
&THCNUM=&PSPLIT-2
&SFFLG='YY' or 'YN' ?
NO
YES
END OF FILE?
NO
YES
READ RECORD TYPE
*
SORT BY SCC
TYPE=1?
NO
YES
TYPE=2?
NO
YES
ERROR: BAD PSPLIT RECORD TYPE
STOP
PROCESS TYPE 1
PROCESS TYPE 2
RETURN TO SM

*DO NOT ADVANCE RECORD POINTER


PROCESS TYPE 1
READ TYPES
*
TYPE=11?
NO
YES
TYPE=12?
NO
YES
ERROR BAD PSPLIT HEADER RECORD TYPE
STOP
&THCNUM< =16
NO
YES
READ CLASS1-CLASS16
READ CLASS17-CLASS&THCNUM
READ CLASS&THCNUM
SKIP OVER RECORD
CLASS&NO=42601
CLASS&NO2=42602
OUTPUT TO WORK.PSPLIT
RETURN TO PSPIN

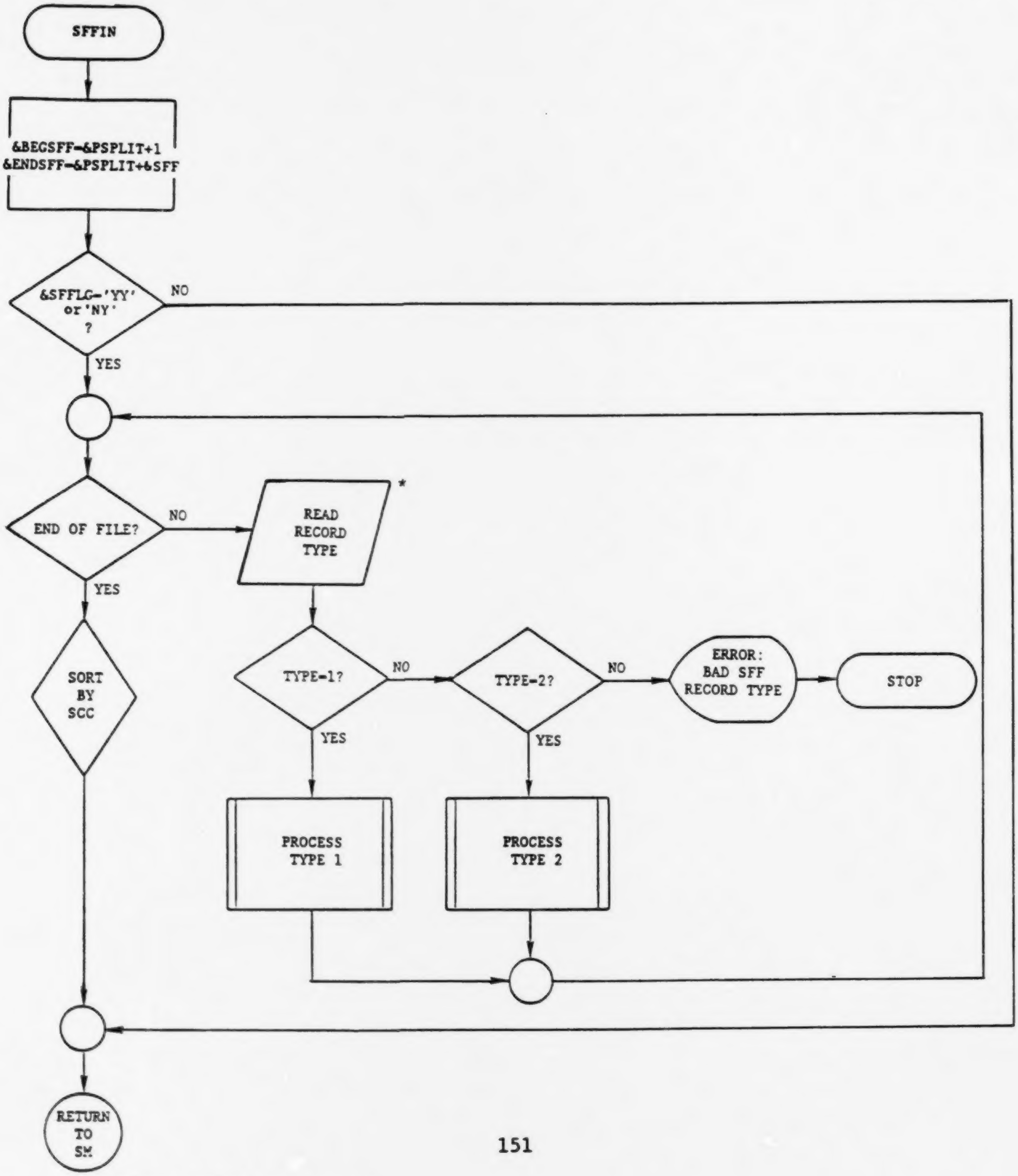
* DO NOT ADVANCE RECORD POINTER

Speciation Module: Area Sources-- Page 7 of 17


PROCESS TYPE 2
READ TYPES AND IDENTIFIERS *
TYPE=21?
NO
TYPE=22?
NO
ERROR BAD PSPLIT SPECIATION RECORD TYPE
STOP
YES
&THCNUM<=16
NO
READ TSF1-TSF16
YES
READ TSF17-TSF&THCNUM
YES
READ TSF1-TSF&THCNUM
READ HCHOWT TSF&NO TSF&NO2
READ HCHOWT TSF&NO TSF&NO2
SKIP OVER RECORD
OUTPUT TO WORK.PSPLIT
RETURN TO PSPIN

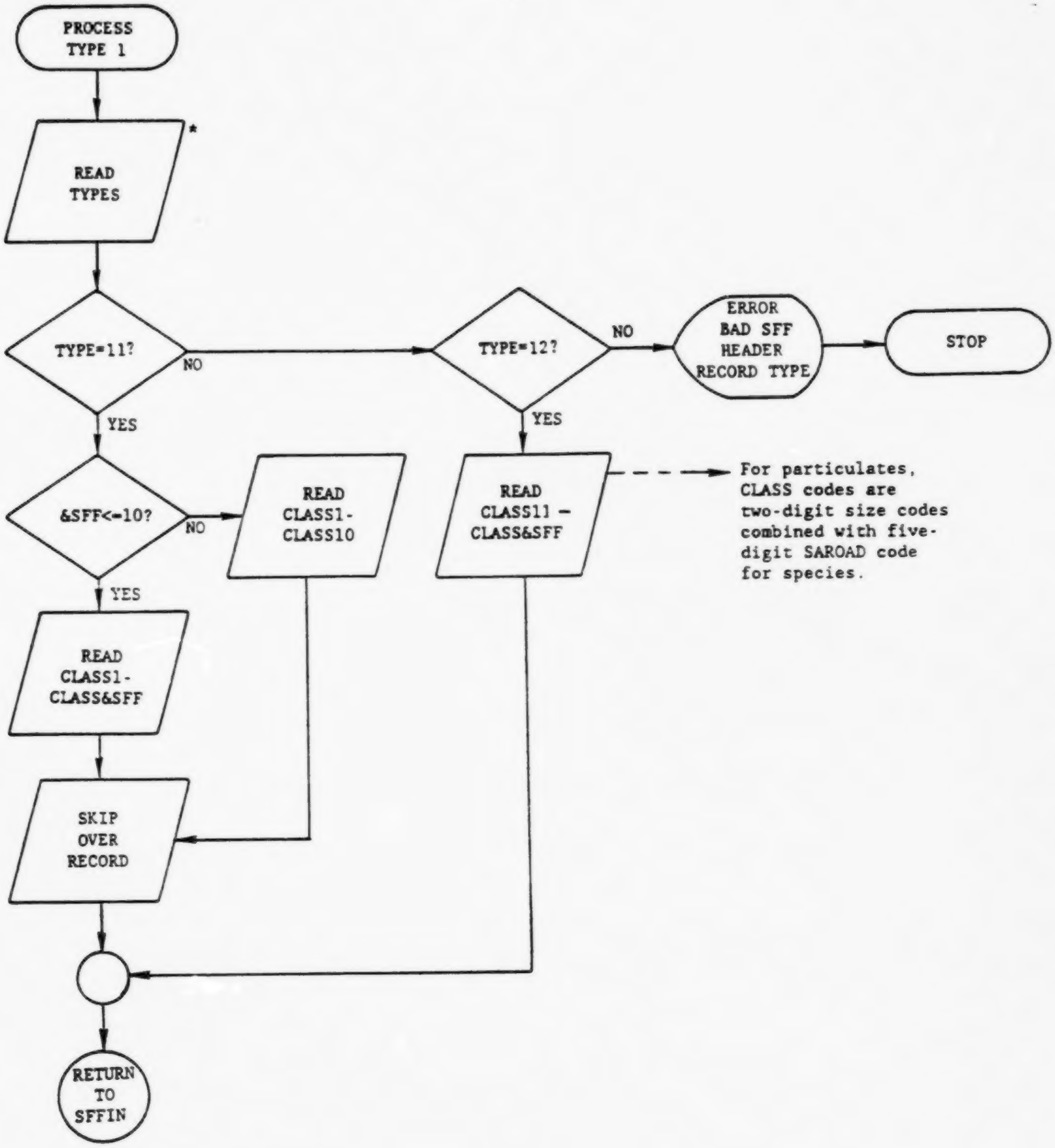
* DO NOT ADVANCE RECORD POINTER

Speciation Module: Area Sources--


SFFIN
&BEGSFF=&PSPLIT+1
&ENDSFF=&PSPLIT+&SFF
&SFFLG='YY' or 'NY' ?
NO
YES
END OF FILE?
NO
READ RECORD TYPE
*
YES
SORT BY SCC
TYPE=1?
NO
TYPE=2?
NO
ERROR: BAD SFF RECORD TYPE
STOP
YES
YES
PROCESS TYPE 1
PROCESS TYPE 2
RETURN TO SM

*DO NOT ADVANCE RECORD POINTER

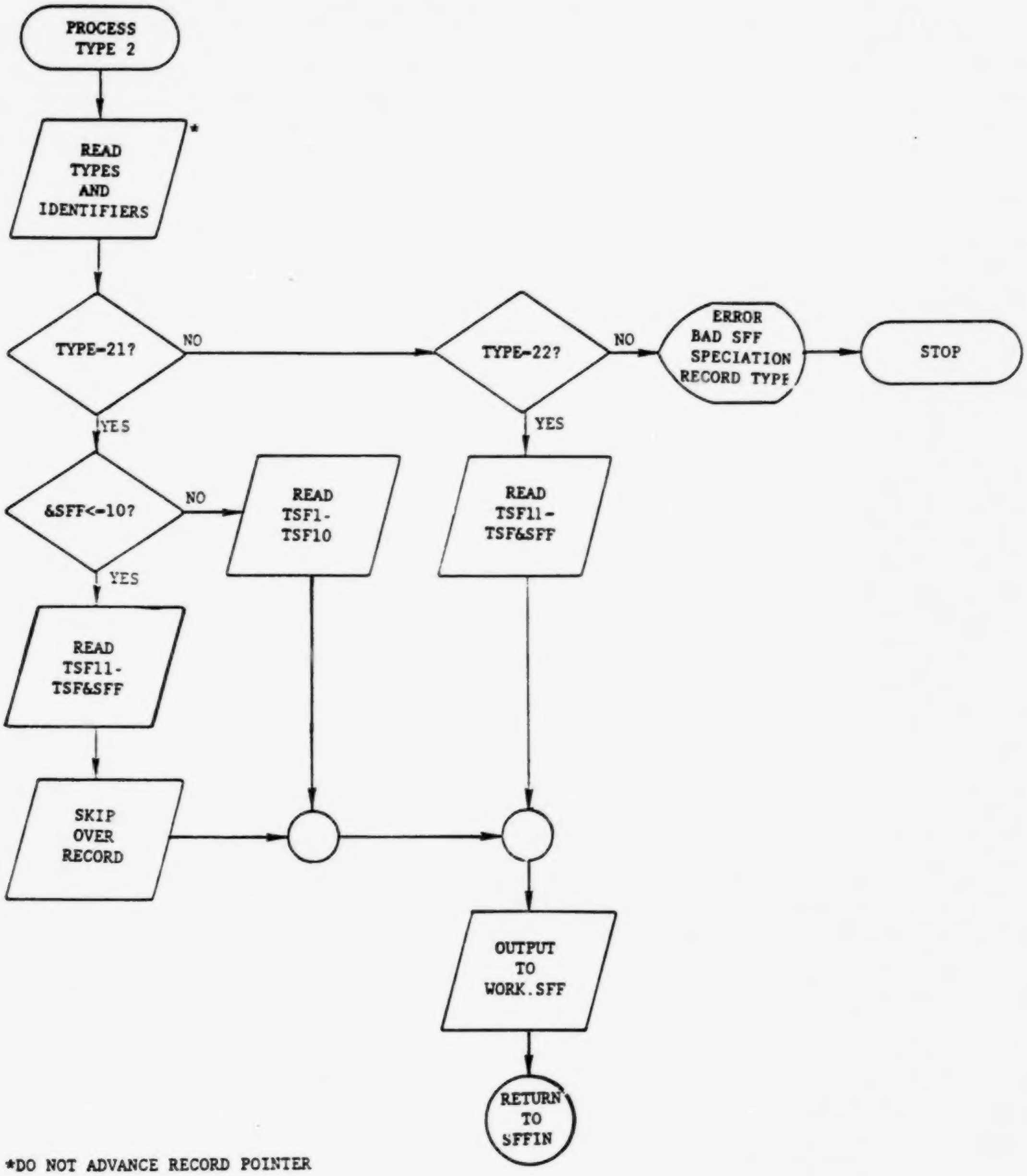
Speciation Module: Area Sources-- Page 9 of 17


PROCESS TYPE 1
READ TYPES
*
TYPE=11?
NO
YES
TYPE=12?
NO
YES
ERROR BAD SFF HEADER RECORD TYPE
STOP
&SFF<=10?
NO
YES
READ CLASS1-CLASS10
READ CLASS11 - CLASS&SFF
READ CLASS1-CLASS&SFF
SKIP OVER RECORD
RETURN TO SFFIN

For particulates, CLASS codes are two-digit size codes combined with five-digit SAROAD code for species.

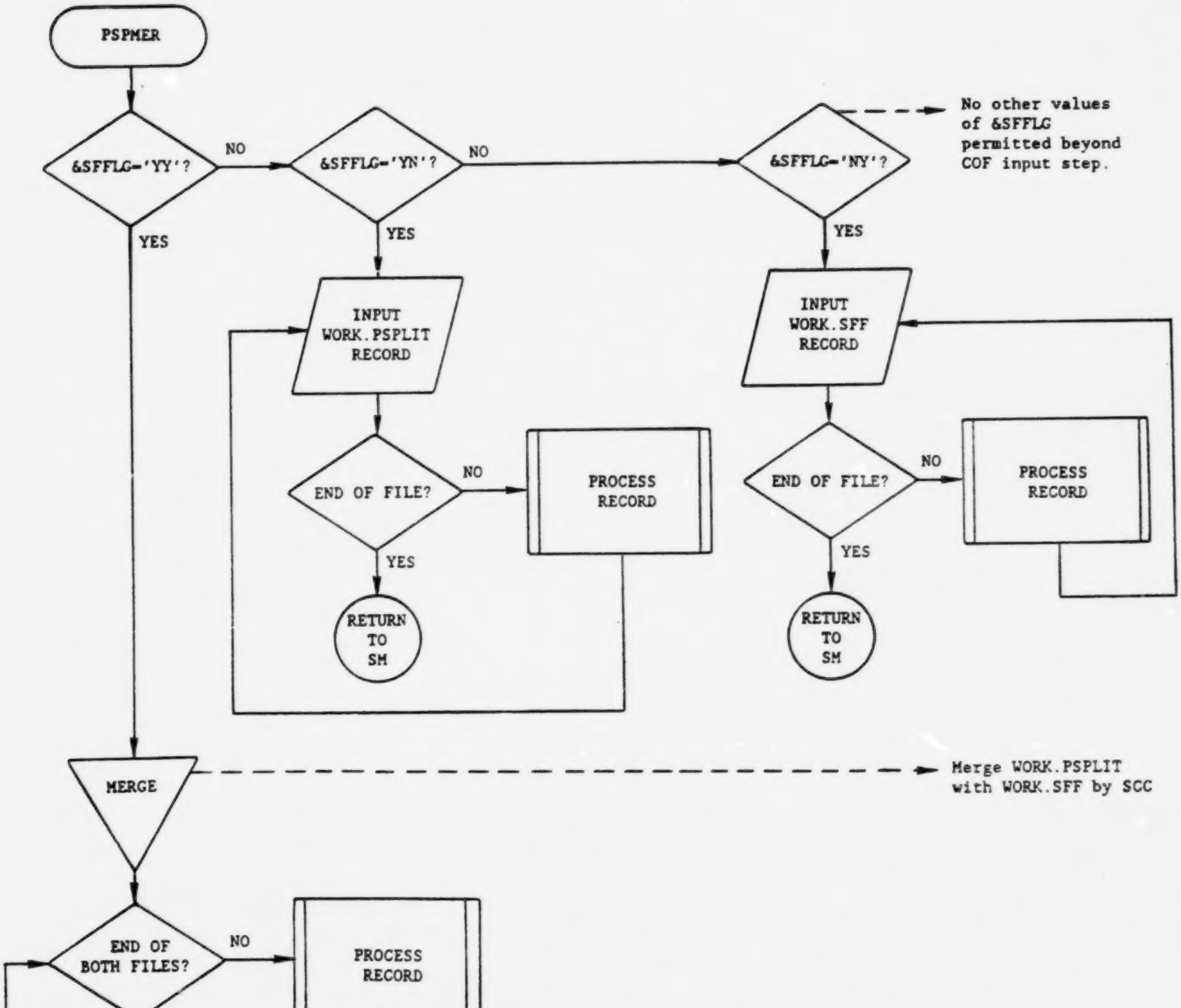
*DO NOT ADVANCE RECORD POINTER

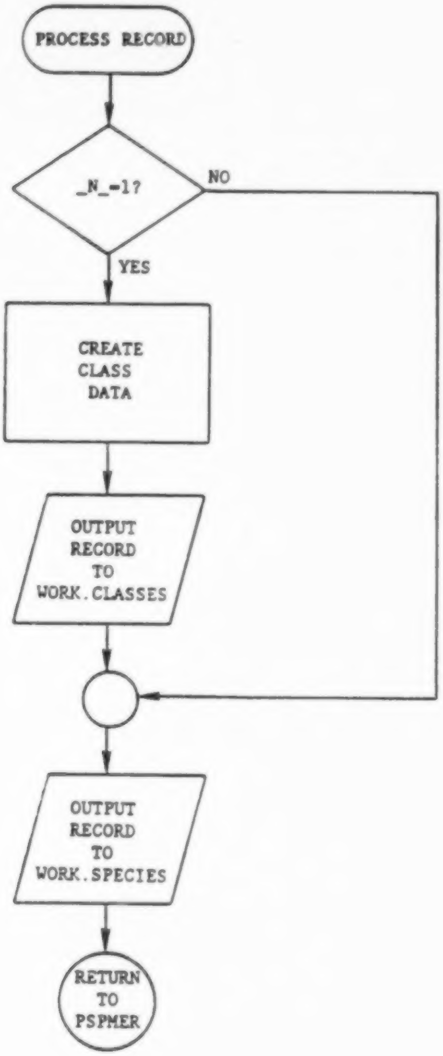
Speciation Module: Area Sources-- Page 10 of 17

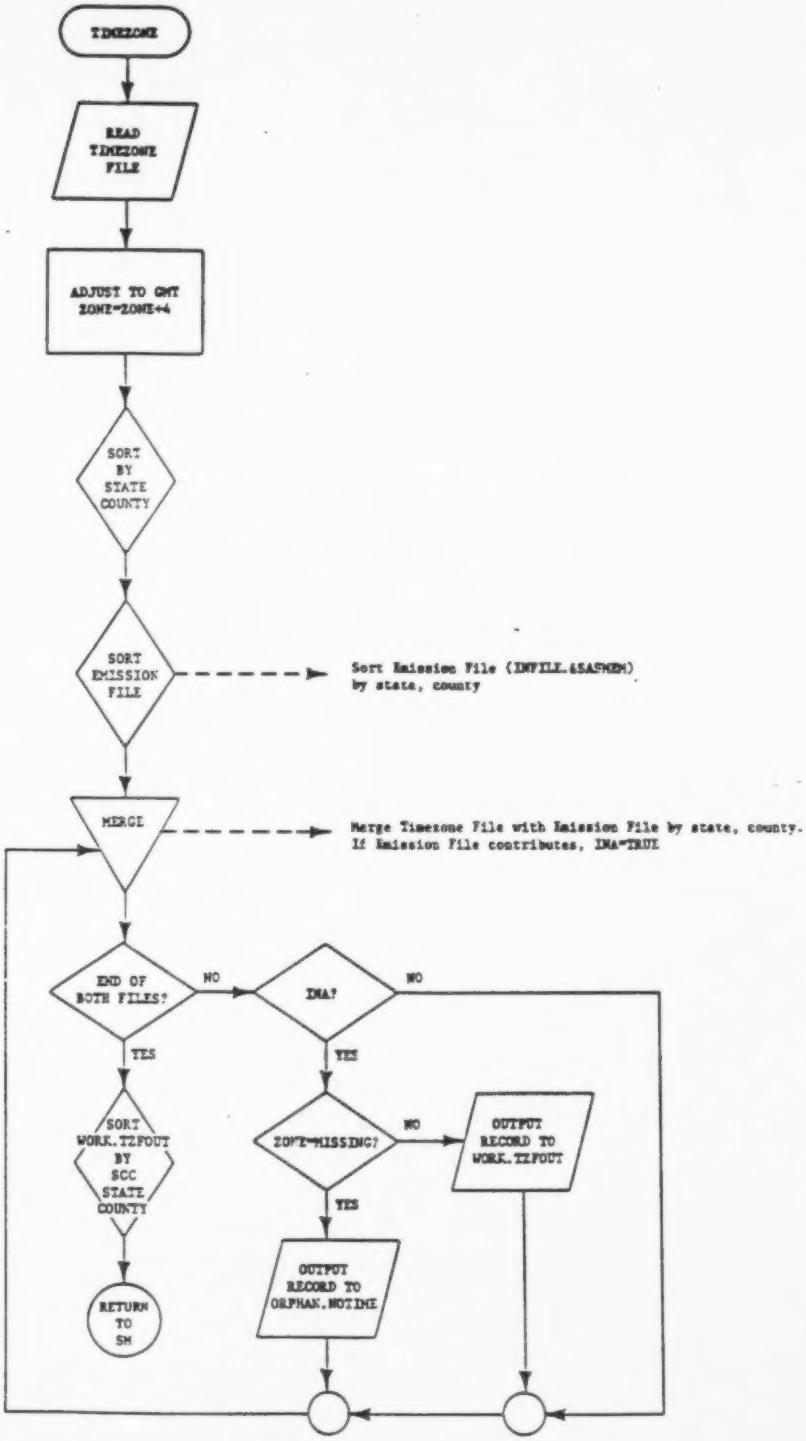

PROCESS TYPE 2
READ TYPES AND IDENTIFIERS
*
TYPE=21?
NO
YES
TYPE=22?
NO
YES
ERROR BAD SFF SPECIATION RECORD TYPE
STOP
&SFF<=10?
NO
YES
READ TSF1-TSF10
READ TSF11-TSF&SFF
READ TSF11-TSF&SFF
SKIP OVER RECORD
OUTPUT TO WORK.SFF
RETURN TO SFFIN

*DO NOT ADVANCE RECORD POINTER

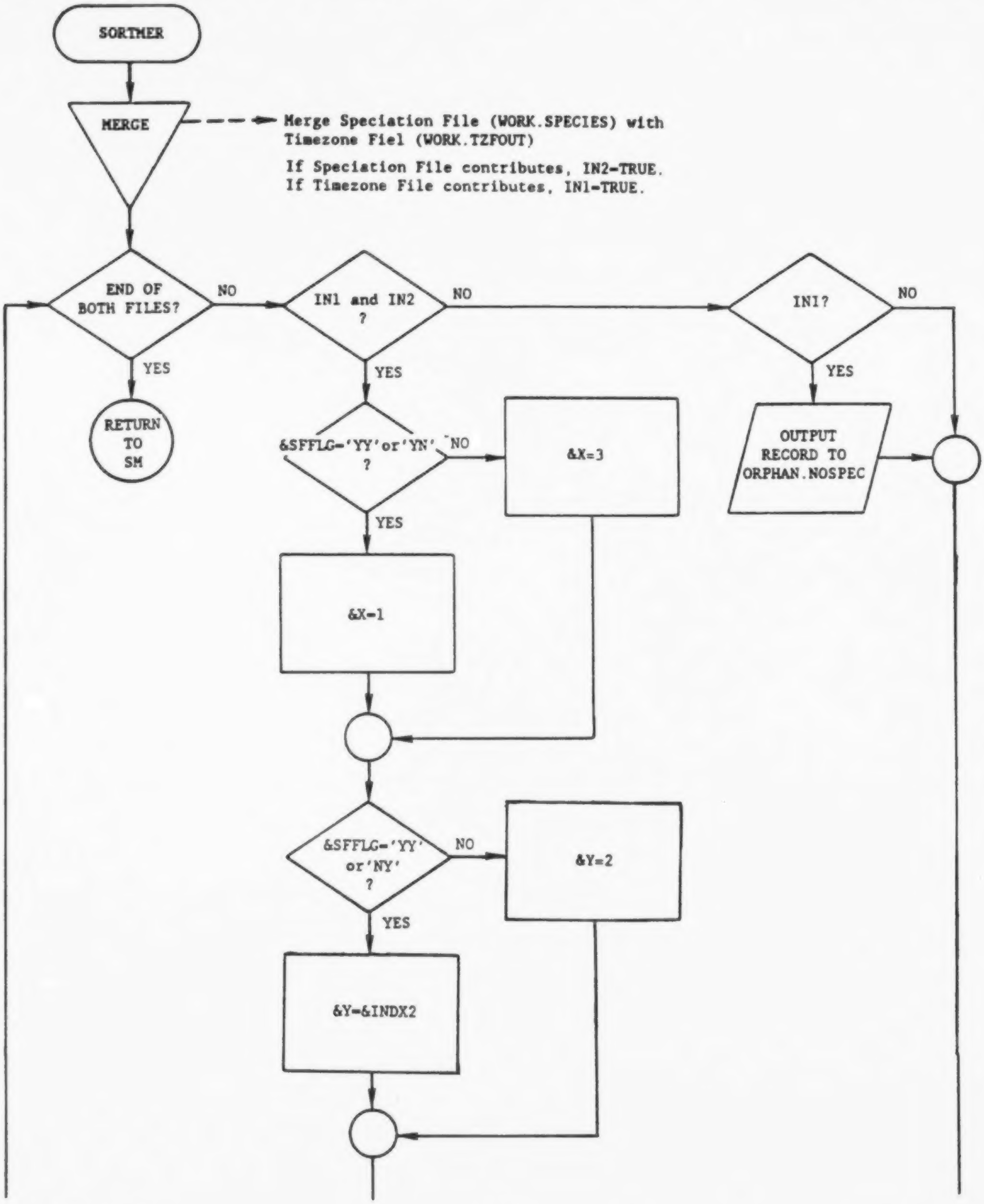
Speciation Module: Area Sources--


PSPMER
&SFFLG='YY'?
NO
&SFFLG='YN'?
NO
&SFFLG='NY'?
No other values of &SFFLG permitted beyond COF input step.
YES
YES
YES
INPUT WORK.PSPLIT RECORD
INPUT WORK.SFF RECORD
END OF FILE?
NO
PROCESS RECORD
YES
RETURN TO SM
END OF FILE?
NO
PROCESS RECORD
YES
RETURN TO SM
MERGE
Merge WORK.PSPLIT with WORK.SFF by SCC
END OF BOTH FILES?
NO
PROCESS RECORD
YES
RETURN TO SM


PROCESS RECORD
_N_=1?
NO
YES
CREATE CLASS DATA
OUTPUT RECORD TO WORK.CLASSES
OUTPUT RECORD TO WORK.SPECIES
RETURN TO PSPMER


TIMEZONE
READ TIMEZONE FILE
ADJUST TO GMT ZONE=ZONE+4
SORT BY STATE COUNTY
SORT EMISSION FILE
Sort Emission File (INFILE.&SASMEM) by state, county
MERGE
Merge Timezone File with Emission File by state, county. If Emission File contributes, IMA=TRUE
END OF BOTH FILES?
NO
YES
IMA?
NO
YES
SORT WORK.TZFOUT BY SCC STATE COUNTY
RETURN TO SM
ZONE=MISSING?
NO
YES
OUTPUT RECORD TO WORK.TZFOUT
OUTPUT RECORD TO ORPHAN.NOTIME

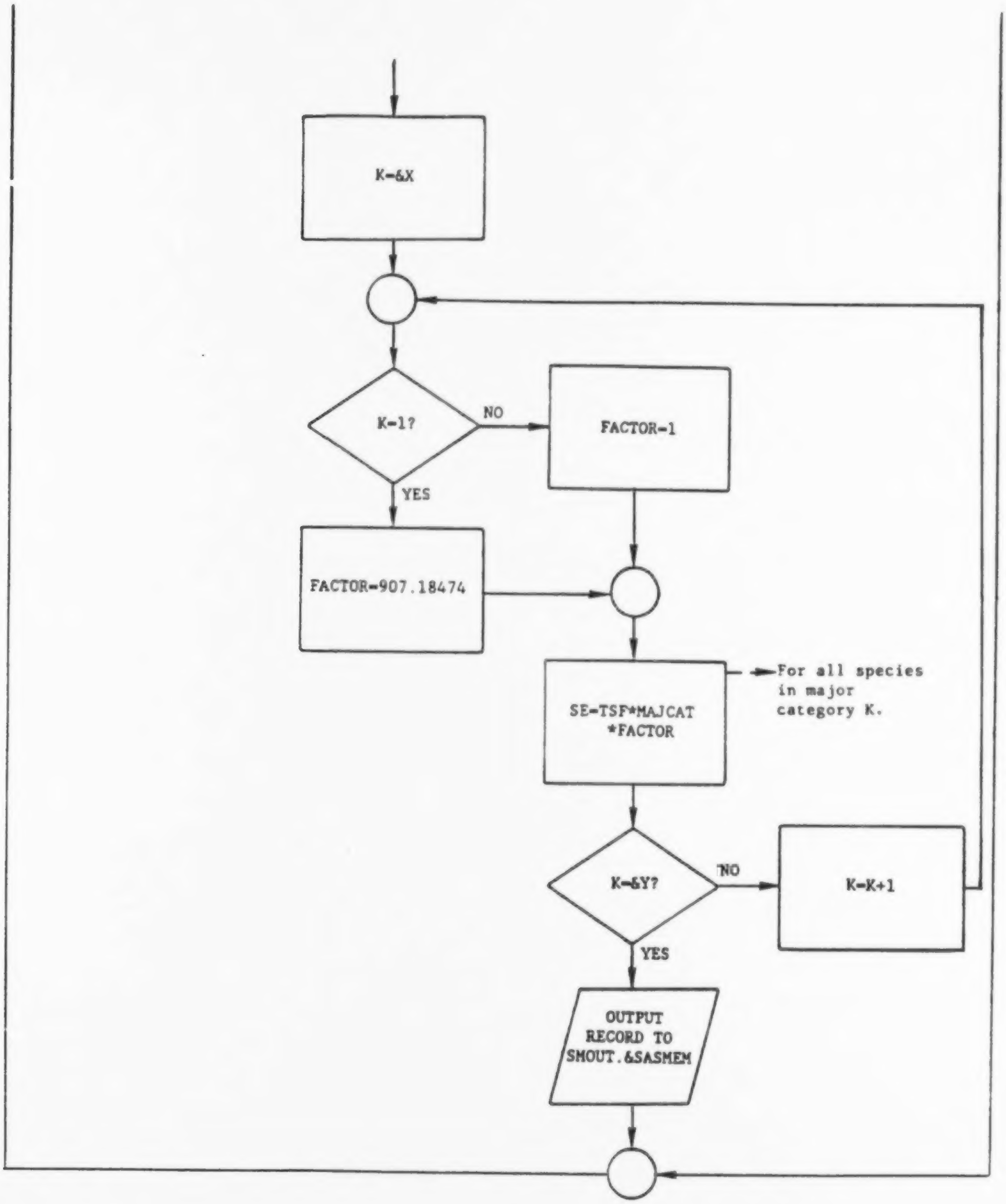
Speciation Module: Area Sources-- Page 14 of 17

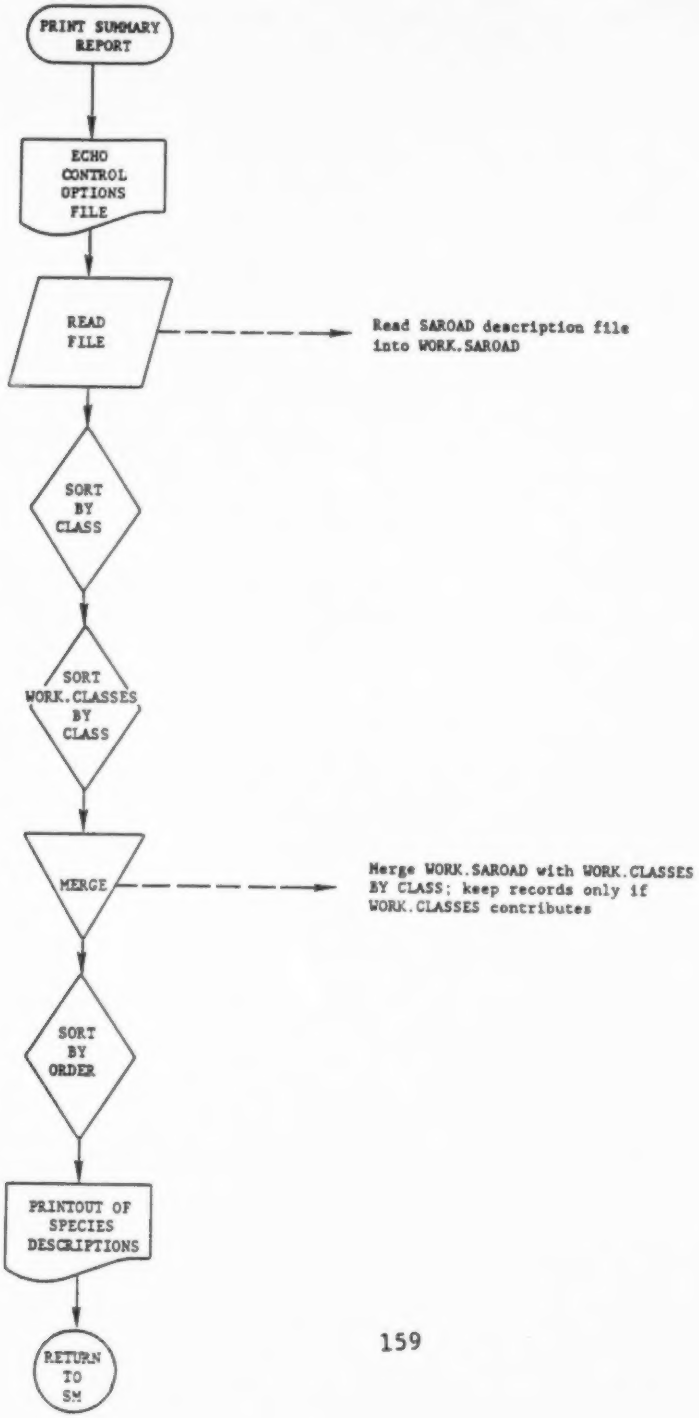

SORTMER
MERGE
END OF BOTH FILES?
NO
YES
RETURN TO SM
IN1 and IN2 ?
NO
YES
IN1?
NO
YES
OUTPUT RECORD TO ORPHAN.NOSPEC
&SFFLG='YY'or'YN' ?
NO
YES
&X=3
&X=1
&SFFLG='YY' or'NY' ?
NO
YES
&Y=2
&Y=&INDX2

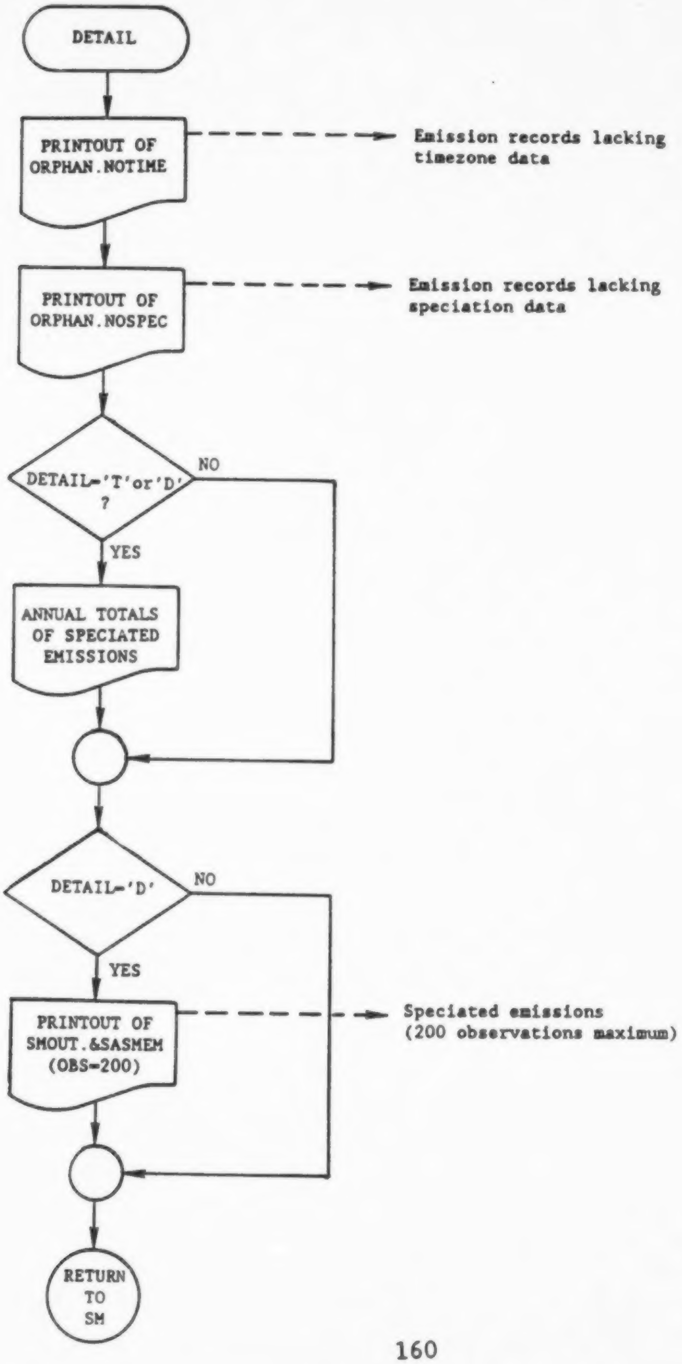
Merge Speciation File (WORK.SPECIES) with Timezone Fiel (WORK.TZFOUT)

If Speciation File contributes, IN2=TRUE.
If Timezone File contributes, IN1=TRUE.

continued on next page


K=&X
K=1?
NO
YES
FACTOR=1
FACTOR=907.18474
SE=TSF*MAJCAT *FACTOR
For all species in major category K.
K=&Y?
NO
YES
K=K+1
OUTPUT RECORD TO SMOUT.&SASMEM


PRINT SUMMARY REPORT
ECHO CONTROL OPTIONS FILE
READ FILE
Read SAROAD description file into WORK.SAROAD
SORT BY CLASS
SORT WORK.CLASSES BY CLASS
MERGE
Merge WORK.SAROAD with WORK.CLASSES BY CLASS; keep records only if WORK.CLASSES contributes
SORT BY ORDER
PRINTOUT OF SPECIES DESCRIPTIONS
RETURN TO SM


DETAIL
PRINTOUT OF ORPHAN.NOTIME
Emission records lacking timezone data
PRINTOUT OF ORPHAN.NOSPEC
Emission records lacking speciation data
DETAIL='T'or'D' ?
NO
YES
ANNUAL TOTALS OF SPECIATED EMISSIONS
DETAIL='D'
NO
YES
PRINTOUT OF SMOUT.&SASMEM (OBS=200)
Speciated emissions (200 observations maximum)
RETURN TO SM

SPATIAL ALLOCATION MODULE

The Spatial Allocation Module (SAM) matches and merges area source emissions with spatial allocation factors enabling the emissions to be assigned to modeling grid cells. For point sources, SAM assigns points to grid cells based on latitude/longitude or UTM coordinates. For NAPAP, SAM uses a latitude and longitude referenced grid system made up of columns and rows originating at the southwestern most corner of the grid increasing north and east. Column and row are calculated from latitude and longitude as follows:

Column = 4(WLON-Longitude) +1
Row = 6(Latitude-SLAT) +1,

where WLON = The westernmost longitude of the grid (125 for 1985 NAPAP)

SLAT = The southernmost latitude of the grid (25 for 1985 NAPAP).

The numbers 4 and 6 represent the number of grids per degree longitude and latitude, respectively. Fractional parts of column and row are truncated; the integer portion is the resulting column and row numbers. The 1985 NAPAP grid is illustrated in Figure 3-1. The northern and eastern boundaries of the grid are 60° north latitude and 50° east longitude, respectively. For ease of readability, approximate 80 x 80 km grids are presented in Figure 3-1, therefore, four 1/4° longitude by 1/6° latitude NAPAP grids make up each cell.

Spatial allocation of point sources may also be accomplished using UTM (rectangular) coordinates. If latitude and longitude are missing from a point record, SAM uses UTM location data. Point sources may be spatially allocated to any user defined grid boundaries and grid cell size by specifying the necessary parameters in the Control Options File. For area sources, SAM will spatially allocate emissions to any grid system in which spatial allocation factors are available. SAM also has the capability of processing a variety of grid cell sizes, the limiting factors being the file size and availability of spatial factors for the specified grid cell size.

SAM has the ability to operate on emissions data from SM, TAM, or directly from MDEM. The primary outputs of SAM are the emissions files containing calculated column and row numbers for point sources and gridded emissions for area sources. Also output are a diagnostic report which summarizes the action performed by SAM and any emission records without spatial data or falling outside the NAPAP grid. A subsetted optional hardcopy listing of the point source emissions and spatial data (50 observations) is also available. For area sources, a subsetted hardcopy listing (200 observations) of the spatially allocated emissions is available. The functional requirements for spatially allocating point and area sources are discussed independently.

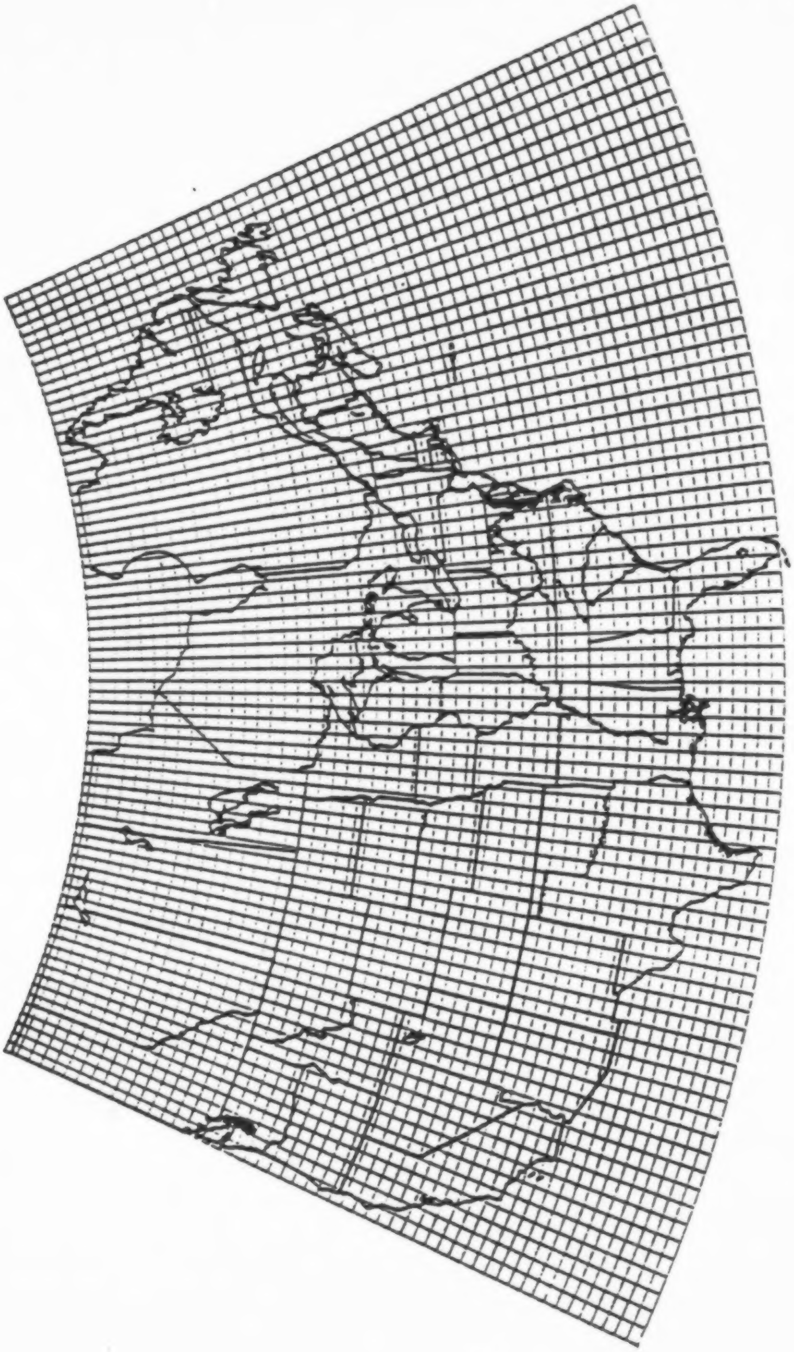


Figure 3-1. The 1985 NAPAP Grid System (Note: 80 x 80 Km grid cells are plotted in this figure).

Spatial Allocation of Point Sources

SAM allocates point source emissions to grid cells on the basis of latitude and longitude data contained in emissions records. SAM reads a point source record, calculates the grid cell within which that set of coordinates falls, and adds the grid cell identification (Column, Row) to the emission record. If latitude and/or longitude data are missing or incorrect, SAM will generate the appropriate values by converting UTM coordinates to latitude and longitude. If UTMs are also missing, the emission record is output to an orphan file and printed with the diagnostic report. Source locations outside the NAPAP study area are output to an error file and also printed with the diagnostic report. These points are also carried through the remainder of FREDS in the point source emissions file and are output with the emissions data. Each point level record also contains a spatial allocation factor of 1 since each point source is assumed to contribute its total emissions to one modeling grid cell.

Spatial Allocation of Area Sources

Spatial allocation of area source data is less straightforward and requires additional input data. Each area source emissions category is reported on a county basis in the area source emissions file(s). Since the subcounty distribution of emissions is not known, emissions are allocated from counties to grid cells on the basis of a known surrogate distribution, e.g., Landsat or census data.

SAM allocates area source emissions from counties to grid cells using the Spatial Allocation Factor File (SAFF). The SAFF provides, for each SCC/county/grid combination, a fractional multiplier representing the portion of the county total of each assigned surrogate which falls within each grid cell in each county. For the 1985 NAPAP inventory, a grid cell represents an area 1/6 degree latitude by 1/4 degree longitude, approximately 20 x 20 kilometers. Spatial allocation factors are currently limited to 160 grids per county and up to 30 spatial allocation categories by the peripheral programs which create them (these will be discussed further under "Peripheral Software"). Another file, the Surrogate Selection File (SSF), matches each area source category, referenced by (pseudo) SCC to the most appropriate surrogate indicator. This file is not directly accessed by SAM and is maintained with the peripheral software.

Each area source emission record is matched to the appropriate set of allocation factors in the SAFF by merging each county level emissions record for each particular area source category with the appropriate set of surrogate allocation factors. For example, if 50 percent of a county's population resides in a specific grid cell, the population surrogate will indicate that 50 percent of that county's emissions allocated by population originated from that grid cell. The emissions are then multiplied by the spatial allocation factors and output for further processing in FREDS.

Flow Chart and Description

SAM processing is illustrated in the accompanying flow charts. An individual "set" of flow charts is presented each for point and area sources. The first diagram of each set represents the overall module flow. Processes depicted by double vertical lines indicate the presence of several subprocesses, and hence a second level of more detailed diagrams are presented for these. For example, the first double-lined process is "READ CONTROL OPTIONS FILE". Starting on the next page, the reader will find a second-level chart with the same name. On completion of the second level of subprocesses, the user returns to the first level. The user would then continue on the first level until the next double-lined process is encountered - "MACRO LOCATE". Again, the reader refers to a second level diagram. This continues until the reader has encountered all processes depicted on the main module flow chart. If a second level process contains a double-lined process box, this refers to a third level subprocess. The user must return to the second level and, when completed, return to the first level to continue.

SAM options are specified in the Run Identification record of the Control Options File. The SAM reads the first record of the COF and determines whether a point or area source emissions file is to be processed. SAM will stop processing in the event of an error in the COF format or if an incorrect source type is specified for the SAS code being executed. SAM then reads the Grid Identification record for both point and area sources and calculates the number of columns, rows, and grid cells based on the latitude and longitude of the grid boundaries supplied in the COF.

For point sources, the LOCATE macro determines the grid cell to which emissions are assigned. Spatial allocation proceeds by first checking a source record for valid latitude and longitude data and calculating grid row and column. If latitude and longitude are either absent or invalid, the record is checked for valid UTM coordinates and the grid position is then calculated using UTM coordinates. If the UTM coordinates are also missing or invalid, the emission record cannot be spatially allocated and is output to an error file. SAM also checks for grid cells outside the specified boundaries. These sources are output to an error file for analysis and, in addition, these sources remain in the point source emissions file. The spatially resolved point source emissions file is output for further processing by FREDS.

For area sources, two additional control records are read. The Subfile Definition record reads in and checks the number of records to be processed by SAM. If the number of records to be processed exceeds 66,000,000, execution ceases and an error message is output. It is, however, unlikely that this value will ever be reached due to hardware processing limitations. The Pollutant Variable List record reassigns variable names to spatially allocated emissions. Once the COF has been read, the spatial factors are read and processed into a SAS data set by the ALLOCATE macro. The Spatial Allocation Factor file consists of one Spatial Allocation record for each SCC, state, county, Column, and Row. The correct factor is assigned to an area source category in the Spatial Allocation Factor Preprocessor (SAFP). SAFP matches spatial factors to area source categories using a Surrogate Selection File (SSF) which contains the appropriate spatial factor category number (population, land use, etc.) for each SCC. The SAFF is then merged with the area source emissions file in the macro ALLOCATE by SCC, state, and county. The merged records are evaluated as follows.

If a record contains data from both the emissions and SAFF files, it is a valid spatial record and is merged with the emissions file. If a record contains only data from the emissions file, it is output to an "orphaned" spatial allocation file and printed with the diagnostic report. For each unmatched emissions record, SCC, state county, and emissions values are listed. Since the spatially allocated emissions file can contain more than one grid cell for each SCC/county record, SAM creates one record for each grid cell within each SCC/county record. The emissions are then multiplied by the spatial allocation factors and output.

Because the spatially allocated output file may contain more than ten times the number of records in th SAM input file, the user may wish to reduce the volume of data by removing records for grid cells containing no emissions. Removal of unnecessary data at this stage of FREDS processing can result in substantial reductions of processing time and cost in subsequent modules.

For both point and area source files, the diagnostic report has at least two levels of detail: summary and detailed. The summary report includes processing messages, record counts for all files, and a listing of the orphan and error files. A hardcopy listing of the point source coordinates or spatially resolved area source emissions may also be requested by specifying "D" for the diagnostic report option. For point sources, SAM limits the number of hard copy records to 50 observations; for area sources, 200 observations are printed with the detailed diagnostic report. For area source files, emissions totals may also be requested by specifying "T" for the diagnostic report option.

Peripheral Software

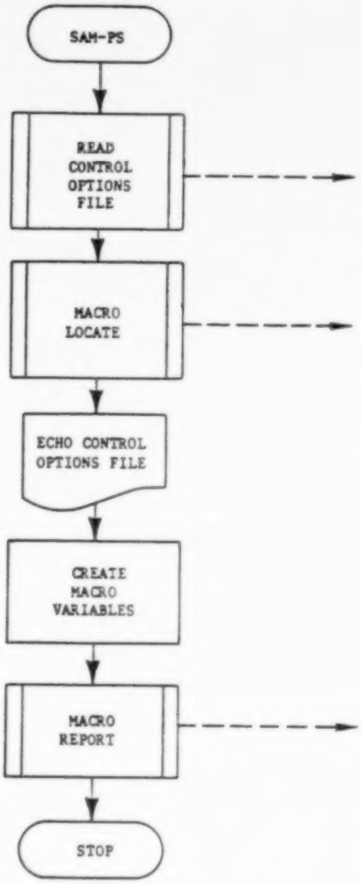
A collection of peripheral software used to generate the spatial allocation factors was previously developed by Alliance and ASRL (currently AREAL) and currently exists in several locations. Spatial allocation factors for the 1985 NAPAP emissions inventory are based on those developed for the 1980 NAPAP effort. New area source categories added for the 1985 inventory (e.g. hazardous waste treatment, storage and disposal facilities) were spatially allocated using existing surrogates. In addition, new quality control procedures were implemented for the 1985 spatial factor processing to assure the validity of these data. A brief historical perspective of the development of the spatial allocation factors is given below.

Spatial allocation factors were developed for the 1980 NAPAP Emissions Inventory based on Landsat land use data and 1980 Census data. The Landsat data provides land use percentages for approximate 20 x 20 km grid cells for 10 land use categories. Two additional categories, composite forest and total land, were calculated by Alliance for a total of 12 land use categories. Composite forest is the sum of coniferous, deciduous and mixed forest land for a grid cell. The twelfth category, total land, represents the fraction of a county's total land contained within each grid cell. The 1980 Census data supplies population and housing data on a subcounty basis. The 14 spatial surrogates are as follows: population, housing, urban land, agricultural land, rangeland, deciduous forest land, coniferous forest land, mixed forest land (including forested wetlands), composite forest, water, barren land, nonforested wetland, mixed agricultural land and rangeland, and total land. In developing spatial factors for area source emissions, the source category in question governed which surrogate was used. For example, the spatial allocation of ammonia emissions from manure field application uses the Landsat agricultural land area as a surrogate while the Census housing data may be used to estimate the number of oil and gas burning dwellings for SO_x emissions. Fractions for each grid cell were based on county to grid area fractions and the fractional land use in each grid cell. The Landsat and Census data were processed separately and later merged for input to the Spatial Allocation Factor Preprocessor (SAFP) program. A Surrogate Selection File was also created for input to SAFP such that spatial categories may be matched to corresponding SCC codes.

The Spatial Allocation Factor Preprocessor reads a Control Options File, Surrogate Selection File (SSF), and the spatial allocation factors derived from the Landsat and Census data. The spatial allocation factors (SAFs) are matched to a surrogate category and summed by county. If the SAF total for a given county is equal to zero, a default surrogate, defined in the control file, is used to define the spatial factor. If the sum of the factors is not equal to 10,000 (corresponding to 100 percent coverage of the county area), the spatial factors are evaluated for erroneous data and normalized if warranted. The spatial allocation factors are reformatted for compatibility with emissions records and output to the Spatial Allocation Factor File (SAFF) for input to SAM. SAFP has two restrictions when calculating spatial allocation factors: the number of grid cells per county is limited to 160 and the number of spatial allocation categories specified may not exceed 30.

Spatial Allocation Module: Point Sources--

Page 1 of 4

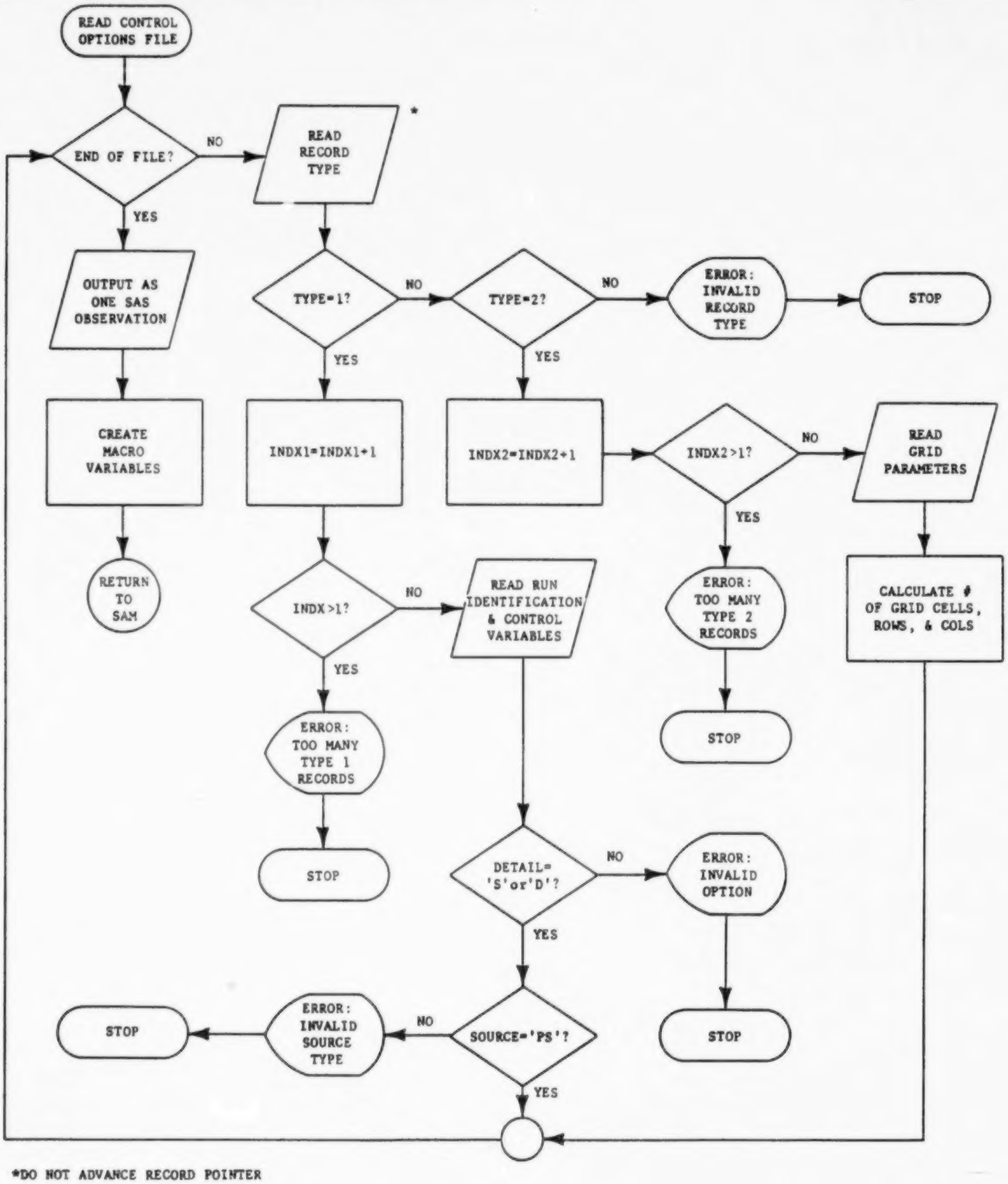

SAM-PS
READ CONTROL OPTIONS FILE
MACRO LOCATE
ECHO CONTROL OPTIONS FILE
CREATE MACRO VARIABLES
MACRO REPORT
STOP

Read run identification and control variables, and define grid.
Create macro variables.

Read emissions file and calculate row and column of point sources in grid defined by COF.

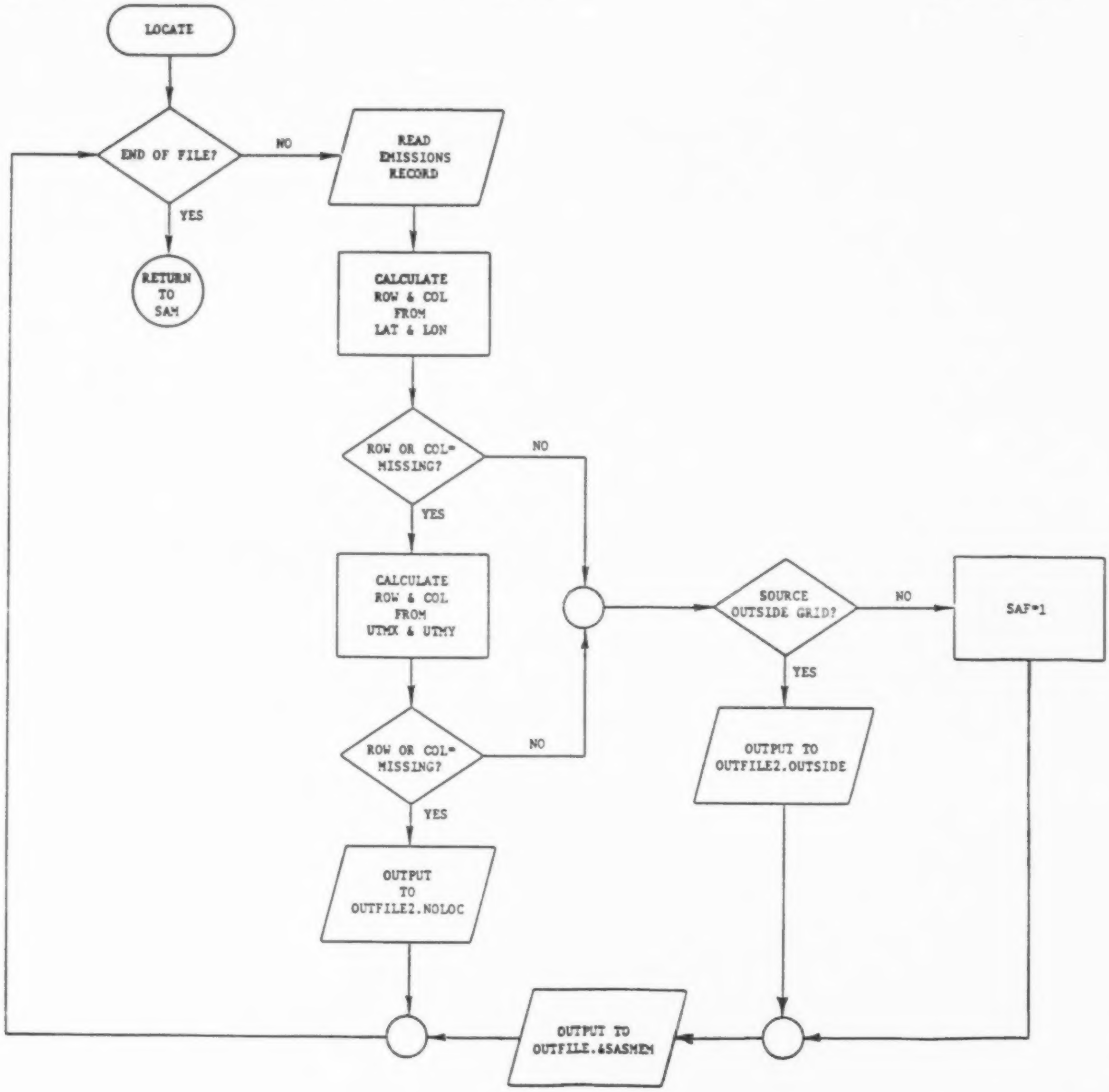
Print reports as specified.

Spatial Allocation Module: Point Sources-- Page 2 of 4

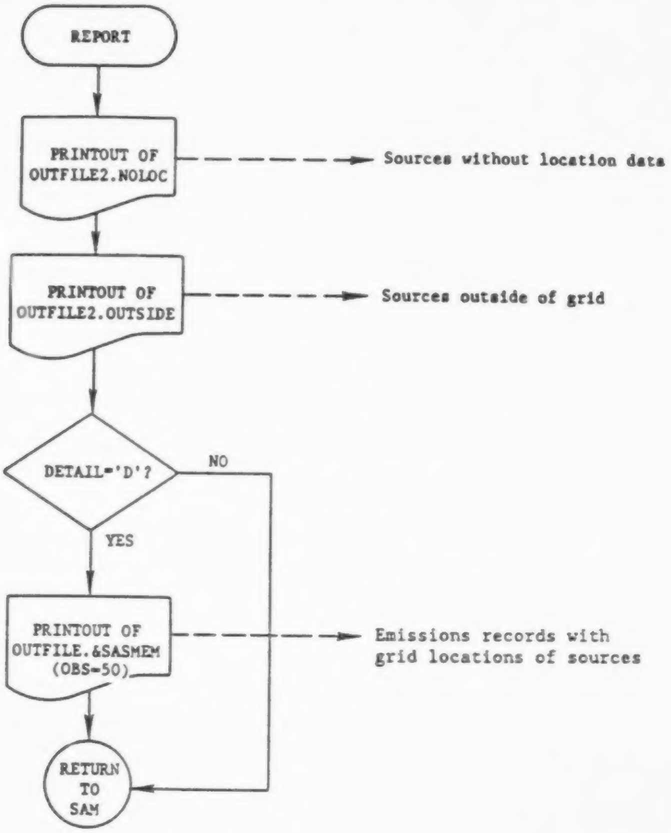

READ CONTROL OPTIONS FILE
END OF FILE?
NO
YES
READ RECORD TYPE
*
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABLES
RETURN TO SAM
TYPE=1?
NO
YES
TYPE=2?
NO
YES
ERROR: INVALID RECORD TYPE
STOP
INDX1=INDX1+1
INDX2=INDX2+1
INDX2>1?
NO
YES
READ GRID PARAMETERS
CALCULATE # OF GRID CELLS, ROWS, & COLS
INDX>1?
NO
YES
READ RUN IDENTIFICATION & CONTROL VARIABLES
ERROR: TOO MANY TYPE 2 RECORDS
STOP
ERROR: TOO MANY TYPE 1 RECORDS
STOP
DETAIL='S'or'D'?
NO
YES
ERROR: INVALID OPTION
STOP
SOURCE='PS'?
NO
YES
ERROR: INVALID SOURCE TYPE
STOP

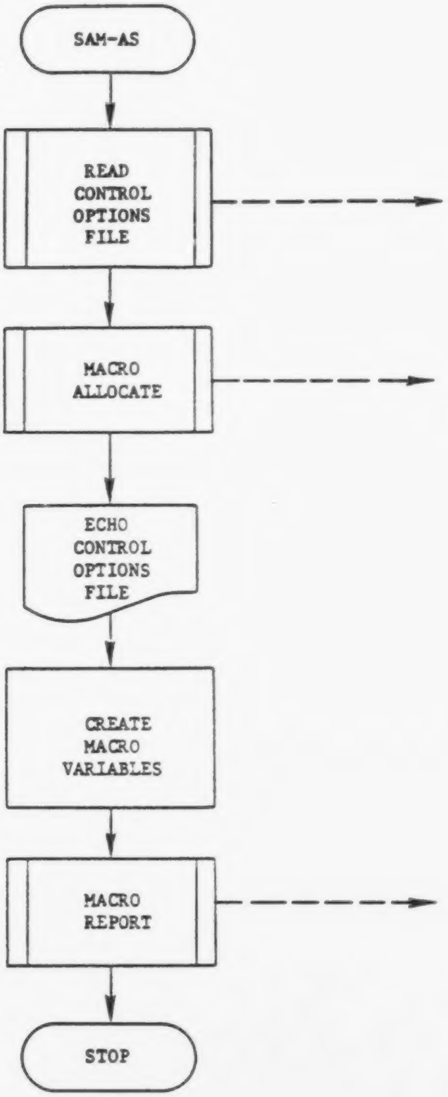
*DO NOT ADVANCE RECORD POINTER

Spatial Allocation Module: Point Sources-- Page 3 of 4


LOCATE
END OF FILE?
NO
YES
RETURN TO SAM
READ EMISSIONS RECORD
CALCULATE ROW & COL FROM LAT & LON
ROW OR COL= MISSING?
NO
YES
CALCULATE ROW & COL FROM UTMX & UTMY
ROW OR COL= MISSING?
NO
YES
OUTPUT TO OUTFILE2.NOLOC
SOURCE OUTSIDE GRID?
NO
YES
SAF=1
OUTPUT TO OUTFILE2.OUTSIDE
OUTPUT TO OUTFILE.&SASMEM

Spatial Allocation Module: Point Sources--


REPORT
PRINTOUT OF OUTFILE2.NOLOC
Sources without location data
PRINTOUT OF OUTFILE2.OUTSIDE
Sources outside of grid
DETAIL='D'?
NO
YES
PRINTOUT OF OUTFILE.&SASMEM (OBS=50)
Emissions records with grid locations of sources
RETURN TO SAM

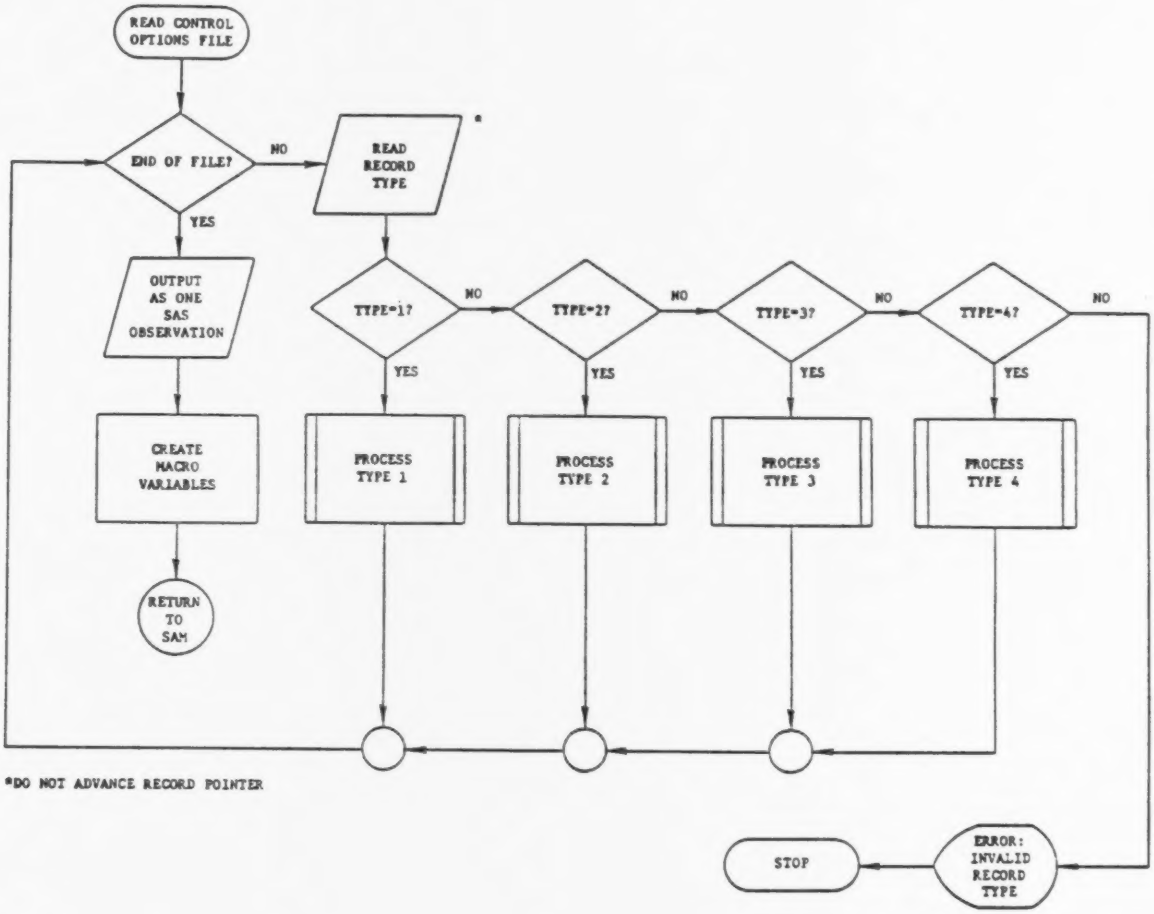

SAM-AS
READ CONTROL OPTIONS FILE
MACRO ALLOCATE
ECHO CONTROL OPTIONS FILE
CREATE MACRO VARIABLES
MACRO REPORT
STOP

Read run identification and control variables and pollutant list, and define grid. Create macro variables.

Read spatial allocation factor file (SAFF), merge with emission file, and multiply emissions by factors.

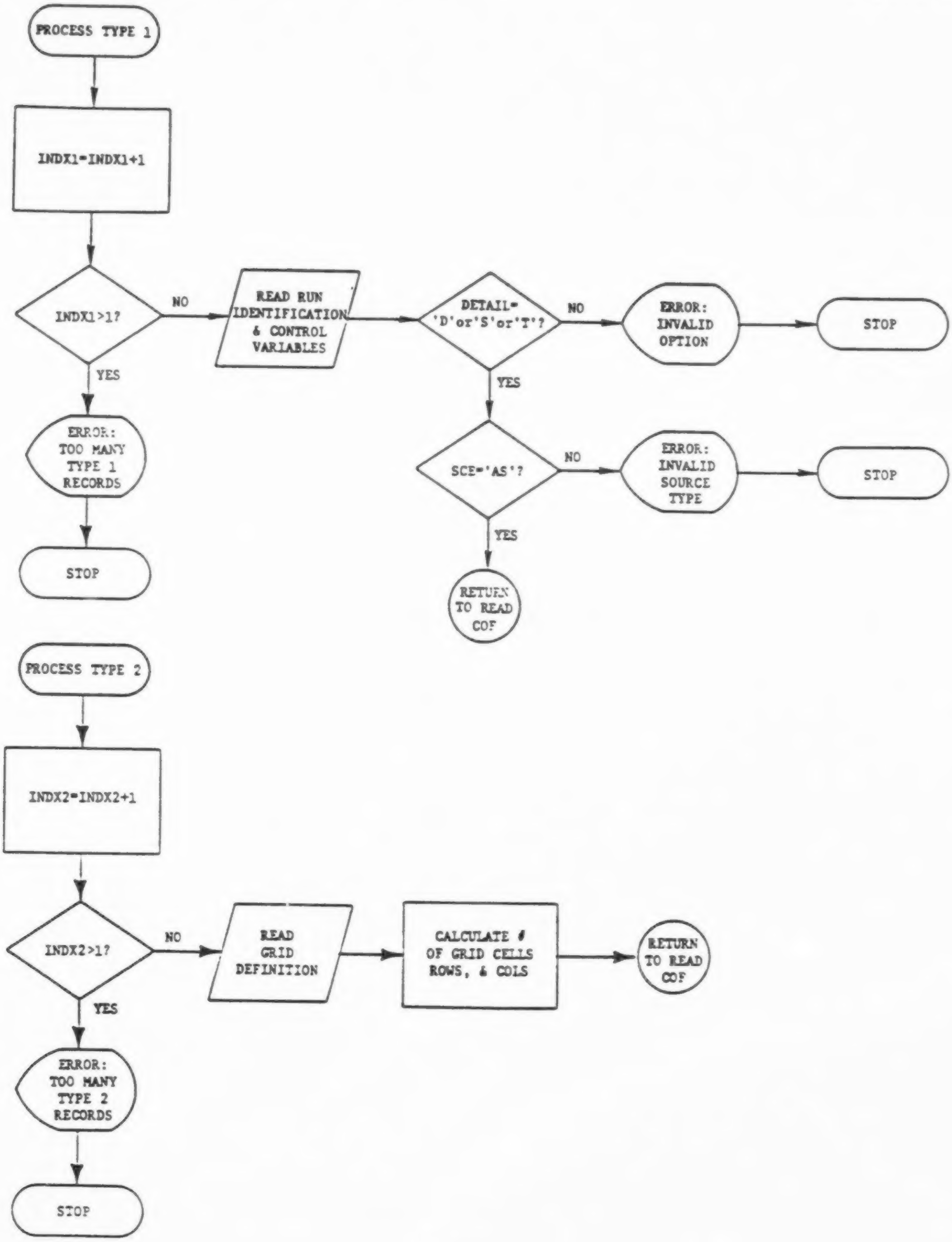
Print reports as specified.

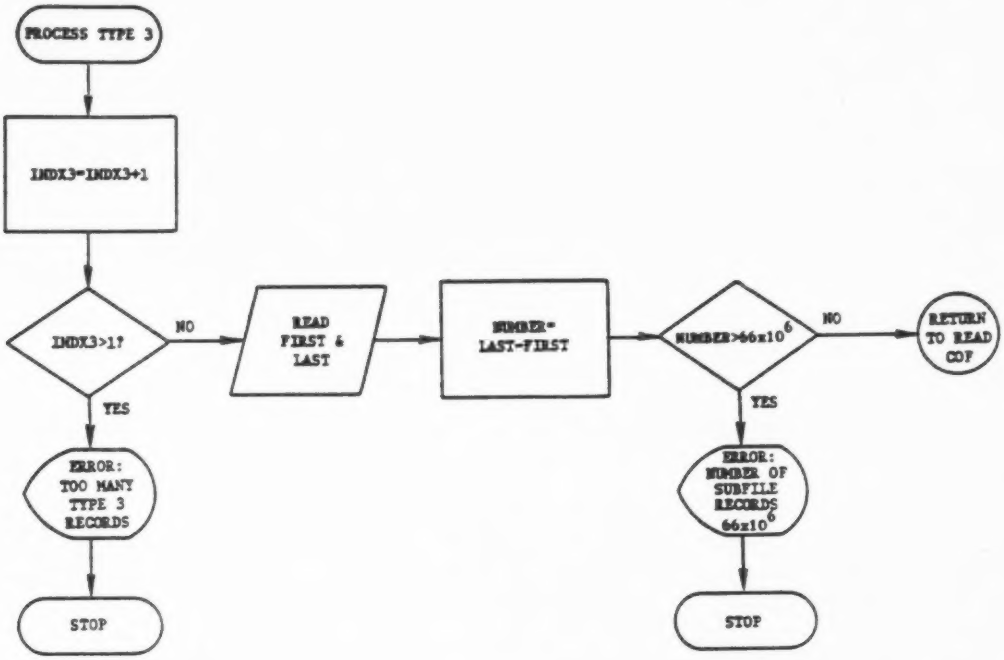
Spatial Allocation Module: Area Sources-- Page 2 of 6

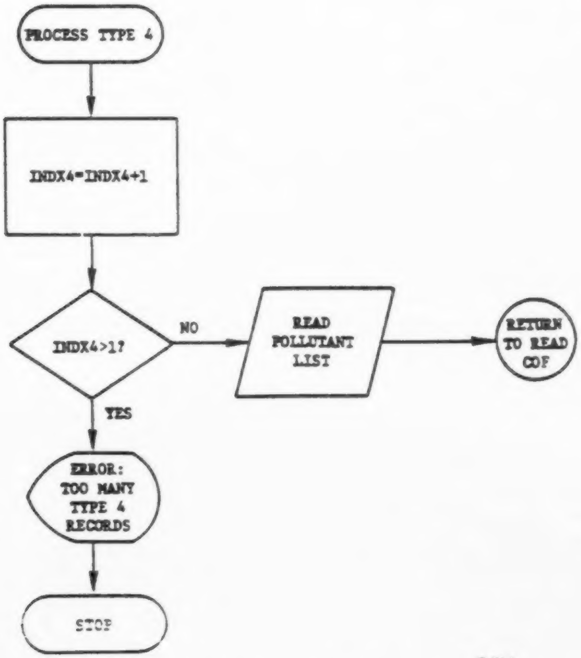

READ CONTROL OPTIONS FILE
END OF FILE?
NO
YES
READ RECORD TYPE
*
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABLES
RETURN TO SAM
TYPE=1?
TYPE=2?
TYPE=3?
TYPE=4?
NO
YES
PROCESS TYPE 1
PROCESS TYPE 2
PROCESS TYPE 3
PROCESS TYPE 4
ERROR: INVALID RECORD TYPE
STOP

*DO NOT ADVANCE RECORD POINTER

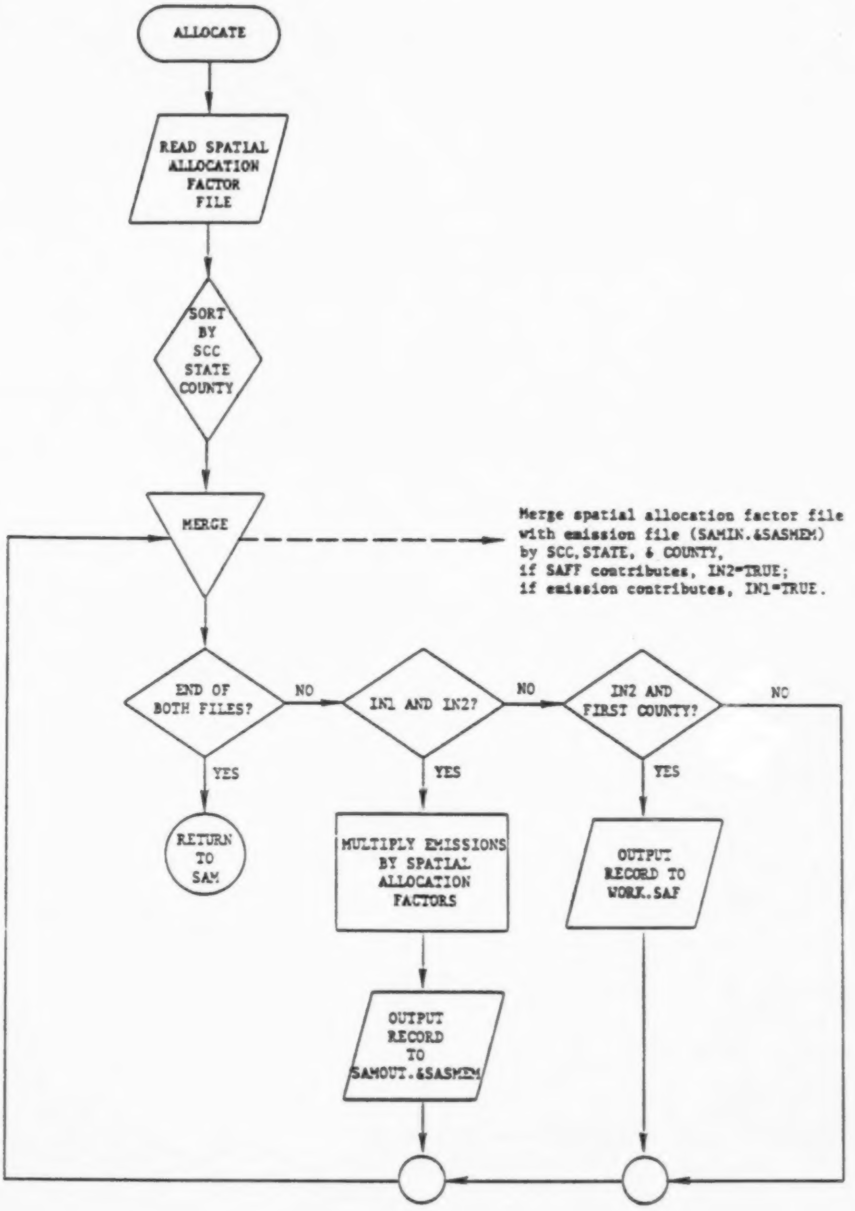
Spatial Allocation Module: Area Sources--


PROCESS TYPE 1
INDX1=INDX1+1
INDX1>1?
NO
READ RUN IDENTIFICATION & CONTROL VARIABLES
DETAIL='D'or'S'or'T'?
NO
ERROR: INVALID OPTION
STOP
YES
SCE='AS'?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES
RETURN TO READ COF
YES
ERROR: TOO MANY TYPE 1 RECORDS
STOP
PROCESS TYPE 2
INDX2=INDX2+1
INDX2>1?
NO
READ GRID DEFINITION
CALCULATE # OF GRID CELLS ROWS, & COLS
RETURN TO READ COF
YES
ERROR: TOO MANY TYPE 2 RECORDS
STOP

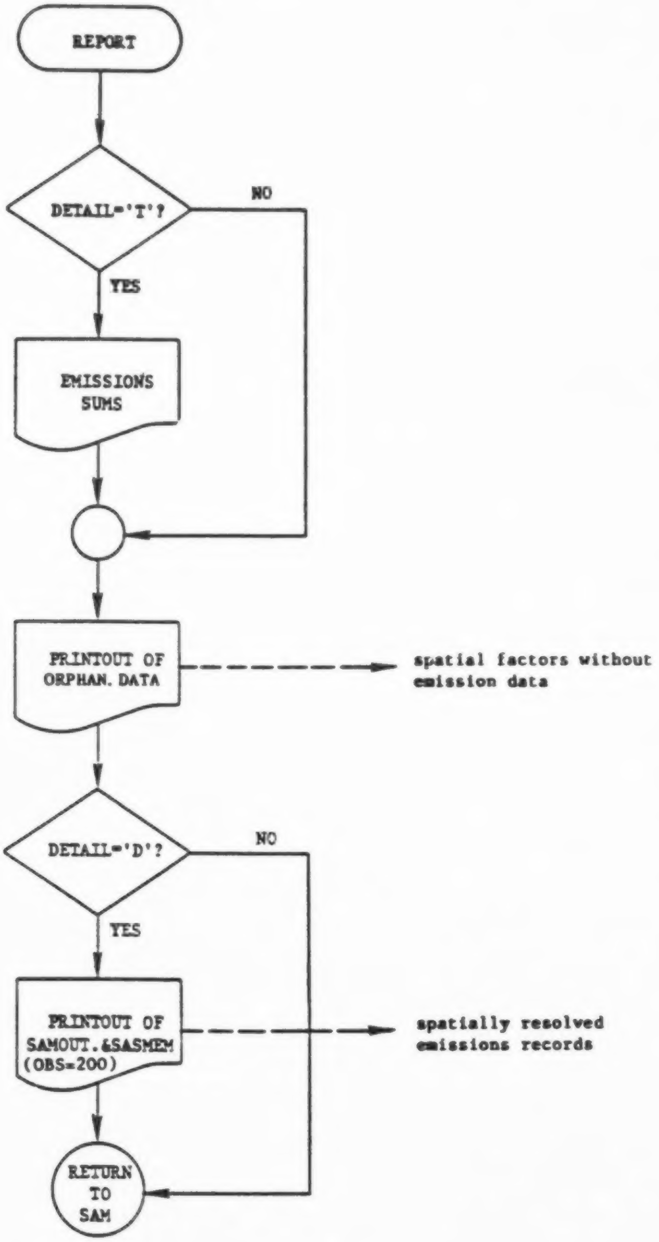

PROCESS TYPE 3
INDX3=INDX3+1
INDX3>1?
NO
YES
READ FIRST & LAST
NUMBER=LAST-FIRST
NUMBER>66x10^6
NO
YES
RETURN TO READ COF
ERROR: TOO MANY TYPE 3 RECORDS
ERROR: NUMBER OF SUBFILE RECORDS 66x10^6
STOP
STOP


PROCESS TYPE 4
INDX4=INDX4+1
INDX4>1?
NO
YES
READ POLLUTANT LIST
RETURN TO READ COF
ERROR: TOO MANY TYPE 4 RECORDS
STOP

Spatial Allocation Module: Area Sources--


ALLOCATE
READ SPATIAL ALLOCATION FACTOR FILE
SORT BY SCC STATE COUNTY
MERGE
END OF BOTH FILES?
NO
YES
RETURN TO SAM
IN1 AND IN2?
NO
YES
MULTIPLY EMISSIONS BY SPATIAL ALLOCATION FACTORS
OUTPUT RECORD TO SAMOUT.&SASMEM
IN2 AND FIRST COUNTY?
NO
YES
OUTPUT RECORD TO WORK.SAF

Merge spatial allocation factor file
with emission file (SAMIN.&SASMEM)
by SCC,STATE, & COUNTY,
if SAFF contributes, IN2=TRUE;
if emission contributes, IN1=TRUE.


REPORT
DETAIL='T'?
NO
YES
EMISSIONS SUMS
PRINTOUT OF ORPHAN. DATA
spatial factors without emission data
DETAIL='D'?
NO
YES
PRINTOUT OF SAMOUT.&SASMEM (OBS=200)
spatially resolved emissions records
RETURN TO SAM

MODEL INPUT PREPROCESSOR

The Model Input Preprocessor (MIP) accepts either (1) the point source emissions files and subfiles into which the appropriate temporal, spatial, and species data have been incorporated, or (2) the fully resolved area source files or subfiles. MIP concatenates the point or area source (sub)files to arrive at complete SAS and EBCDIC (or ASCII) point or area source Modeler's Tapes. Area source data are further sorted by GMT, and hourly totals for each subspecies are tabulated and printed in the diagnostic report. For point sources, the data are sorted by Column and Row and are then output. For area sources, the control file allows the user to specify whether the output data set is to be sorted by column and row or by SCC, state, and county. In the case where there is only one area source input file, the sort and grid total steps are not executed.

A diagnostic report containing SAS summary statistics documenting the actions of the MIP accompanies the SAS-formatted Modeler's Tapes. An optional listing of hourly totals for area sources is also available by specifying "T" for the detail option. The totals option also outputs area source emissions records to a backup tape.

The SAS-formatted Modeler's Tapes are converted to EBCDIC or ASCII characters as an additional job step to the MIP JCL or if desired, as a separate program. The program listing is supplied in Appendix E with the MIP source code. For point sources, the Control Options File reads in the number of subspecies in the emissions file. Based on this value, the SAS-EBCDIC (or ASCII) program sets the appropriate arrays. The SAS-EBCDIC (ASCII) conversion for area sources requires specification of the total number of pollutants and the level of resolution of the emissions (e.g., gridded versus nongridded). A brief diagnostic report summarizing user specified control options is printed for point and area sources.

Resolution of the point source Modeler's Tape into speciated, hourly, gridded emissions requires multiplication of annual emissions by their respective factors. A sample SAS program to resolve point source emissions is presented in Figure 3-2. It should be noted that in these programs, hourly temporal factors are no longer offset to GMT, as this is done in TAM.

Flow Chart and Description

The Model Input Preprocessor (MIP) can merge a number of point or area source emissions files or subfiles. The user, however, should be aware of necessary space requirements before attempting to combine a large number of subfiles. The flow chart for this module is found at the end of this section. The first diagram represents the overall module flow, and where

```
*;
OPTIONS MPRINT;
*;
***** PSR WILL PRODUCE GRIDDED, ALLOCATED EMISSIONS FOR 1985
      NAPAP POINT SOURCE FILES SUITABLE FOR A MODELER'S TAPE;
*;
***** TO EXECUTE PROVIDE THE NUMBER OF THE TEMPORAL SCENARIO
      TO BE ALLOCATED(1-12) TO THE MACRO %RESOLVE;
*;
***** THE OUTPUT FILE CONTAINS THE GRID COLUMN AND ROW (COL,ROW),
      THE GMT HOUR (GMT) AND THE FULLY RESOLVED EMISSIONS (GPOLL1-
      GPOLL59) IN TONS/HOUR FOR ALL POLLUTANTS EXCEPT THE 32 THC
      SPECIES WHICH HAVE UNITS OF GM-MOLES/HOUR.;
*;
***** NOTE THAT THE OUTFILE CONTAINS 24 TIMES AS MANY RECORDS
      AS THE INFILE, ALTHOUGH THE RECORDS HAVE FEWER VARIABLES;
*;
%MACRO RESOLVE(TAFNO);
%*;
%*---- CALCULATE POSITION OF HOURLY TEMPORAL FRACTIONS TO BE APPLIED;
%*---- BASED ON SCENARIO NUMBER (TAFNO);
%*;
%LET A=%EVAL((&TAFNO-1)*24+1);
%LET B=%EVAL(&A+23);
*;
*---- OPEN DATASETS AND DEFINE SAS ARRAYS;
*;
DATA OUTFILE.DATA(KEEP=COL ROW GMT GPOLL1-GPOLL59);
   SET INFILE.DATA;
   ARRAY SAROAD(K) SAROAD1-SAROAD15;
   ARRAY EMISS(K) EMISS1-EMISS15;
   ARRAY SF SF1-SF49;
   ARRAY POLL(N) POLL1-POLL59;
   ARRAY GPOLL(N) GPOLL1-GPOLL59;
   ARRAY HFGMT(A) HFGMT&A-HFGMT&B;
   ARRAY GHOUR(A) GHOUR1-GHOUR24;
*;
*---- EXTRACT POLLUTANTS AND SPECIATE;
*;
   DO K=1 TO NUMPOLL;
      SELECT (SAROAD);
         WHEN (42401) POLL1=EMISS /* SO2 */;
         WHEN (12403) POLL2=EMISS /* SO4 */;
         WHEN (11101) DO;
            POLL3=EMISS /* TSP */;
            DO _I_=35 TO 49;
               N=_I_+10;
               POLL=POLL3*SF /* ALKALINE DUST SPECIES */;
            END;
```

Figure 3-2. Sample SAS program for resolving point source emissions.

```
         END;
         WHEN (42101) POLL4=EMISS /* CO */;
         WHEN (42302) POLL5=EMISS /* HCL */;
         WHEN (42303) POLL6=EMISS /* HF */;
         WHEN (42603) DO;
            POLL7=EMISS /* NOX */;
            POLL43=POLL7*SF33 /* NO */;
            POLL44=POLL7*SF34 /* NO2 */;
         END;
         WHEN (42604) POLL8=EMISS /* NH3 */;
         WHEN (43104) POLL9=EMISS /* VOC */;
         WHEN (43101) DO;
            POLL10=EMISS /* TOT HC */;
            DO _I_=1 TO 32;
               N=_I_+10;
               POLL=POLL10*SF*907.18474 /* SPECIES(GM-MOL PER YR) */;
            END;
         END;
         OTHERWISE;
      END;
  END;
*;
*----- ALLOCATE TEMPORALLY AND OUTPUT 1 OBSERVATION PER HOUR;
*;
  DO A = 1 TO 24;
     GHOUR=HFGMT*SEA&TAFNO*DAY&TAFNO;
  END;
  DO A=1 TO 24;
     GMT=A;
     DO N=1 TO 59;
        GPOLL=POLL*GHOUR;
     END;
     OUTPUT;
  END;
%MEND RESOLVE;
*;
*----- INVOKE THE MACRO;
*;
%RESOLVE(7);
*;
/*
```

Figure 3-2 (continued).

space permits, processes within the various subroutines. Processes depicted by double vertical lines indicate the presence of one or more subprocesses, and hence a second level chart is presented. For MIP, the first double-lined process is "READ CONTROL OPTIONS FILE". On the next page, the reader will find a second level chart with the same name. On completion of the second level chart, the reader returns to the first, and continues on the first level as denoted by the flow arrows. A flowchart for the SAS-EBCDIC (or ASCII) conversion is included with the MIP flow diagrams presented here.

The first action performed by MIP is to read the Control Options File (COF), validate the input, and output it as a single SAS observation. The data from the COF is used by a SAS macro, CHOOSE, to construct the proper SAS command line to merge the specified files. CHOOSE, in turn, invokes the COMBINE, POINT, or DETAIL macros, based on the source type and detail options selected.

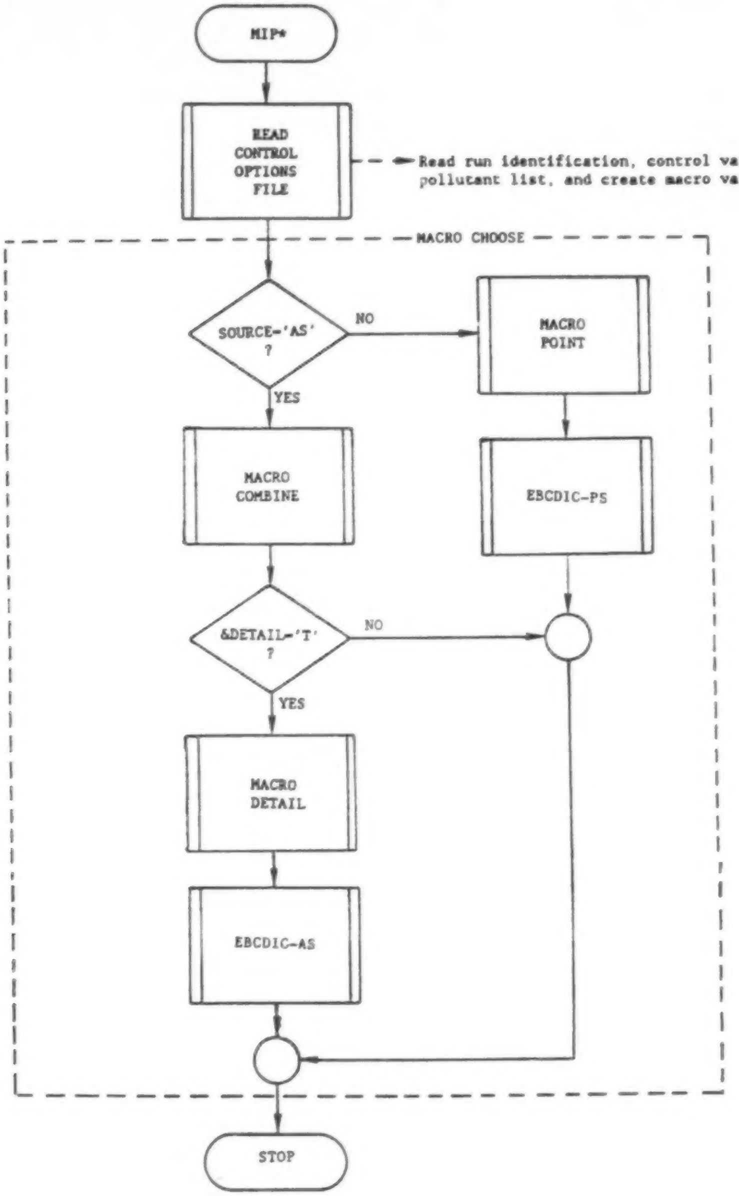
The COMBINE macro checks the number of area source emissions files input to MIP. If there is more than one file, the macro combines area source files or subfiles and sums by Column, Row, and GMT or by SCC, state, county, and GMT, depending on the resolution option (gridded or nongridded) specified in the COF. If there is more than one point source emissions input file, the POINT macro concatenates emissions point source files and sorts by column and row. The combined files are output to a SAS-formatted file.

Once the files have been successfully combined, the DETAIL macro is called to calculate area source hourly totals if specified by the diagnostic report detail option. For point and area sources, the summary option yields only the SAS job log.

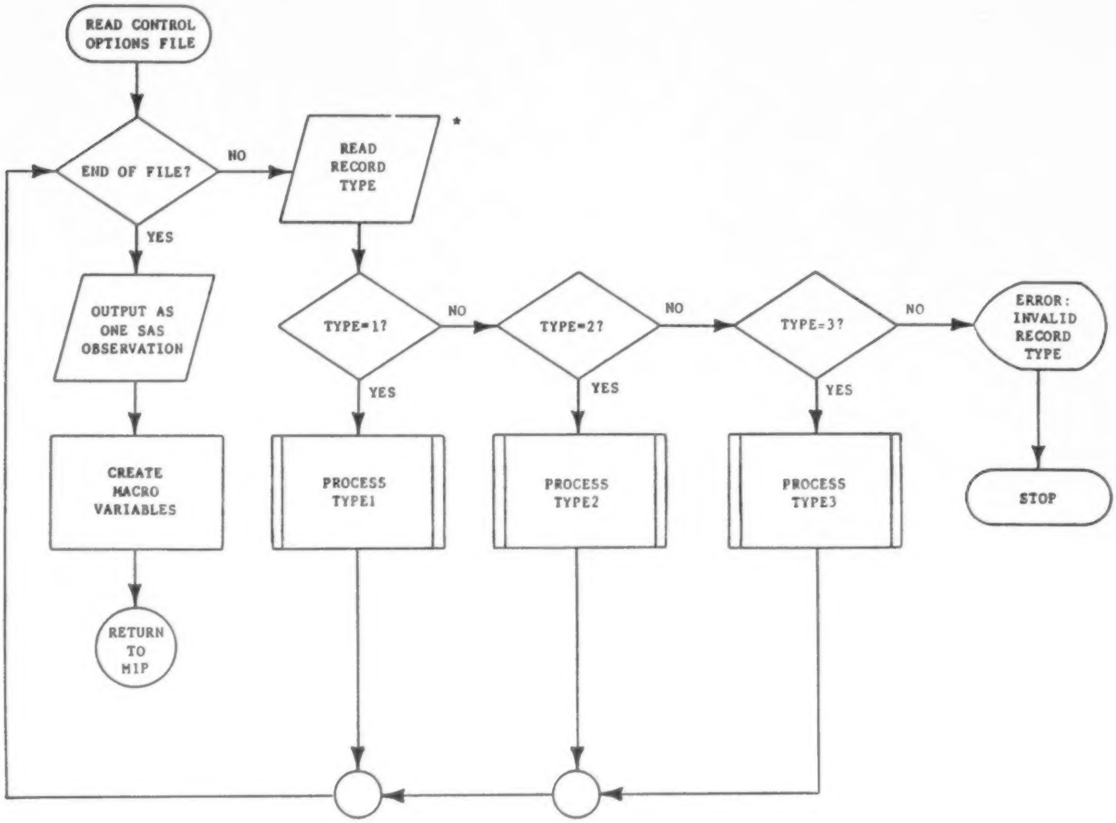
The SAS-formatted emissions output file is converted to EBCDIC or ASCII format in a separate job step. The SAS code is the same for an EBCDIC and ASCII conversion. DCB parameters in th JCL distinguish between the EBCDIC and ASCII output. These are discussed under "control statements" for MIP. The first step for both point and area source processing is to read and validate the control options file and create macro variables from the control options variables. For point sources, the number of pollutant subspecies is read in the variable NUMSPEC. A brief diagnostic report summarizing the Control Option File is written and the macro WRITE is invoked to convert the SAS-formatted file to EBCDIC or ASCII characters.

For area sources, the total number of species (includes annual pollutants plus subspecies) is specified by the variable NUMPOLL. In addition, EMRES specifies whether a gridded or county-level area source emissions file is being processed. A brief report summarizing the control options file is written. Next, the macro WRITE is invoked and the SAS-formatted data are converted to EBCDIC or ASCII characters and output.

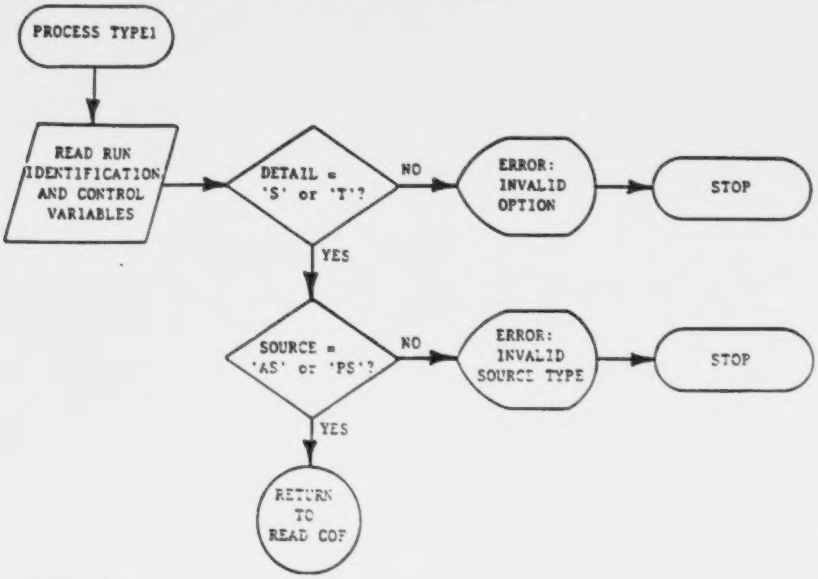
Model Input Preprocessor/EBCDIC Conversion-- Page 1 of 9

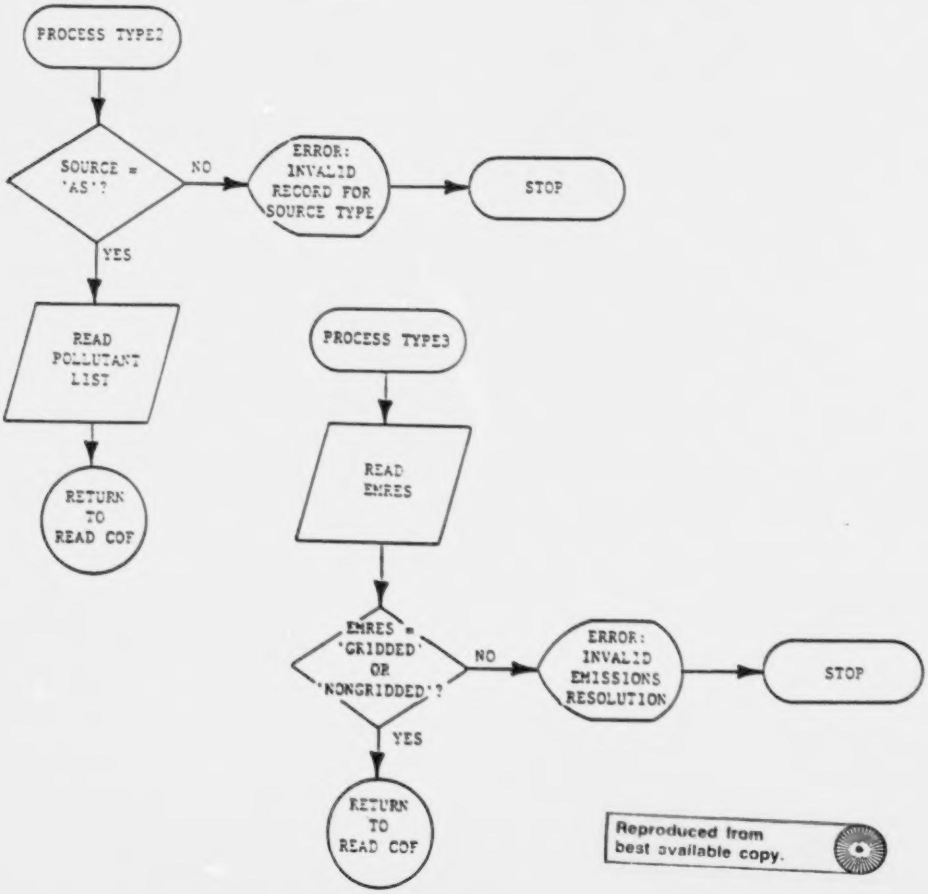

MIP*
READ CONTROL OPTIONS FILE
Read run identification, control variables and pollutant list, and create macro variables
MACRO CHOOSE
SOURCE='AS' ?
NO
YES
MACRO POINT
MACRO COMBINE
EBCDIC-PS
&DETAIL='T' ?
NO
YES
MACRO DETAIL
EBCDIC-AS
STOP

*NOTE: MIP IS RUN SEPARATELY FOR EACH SOURCE TYPE


READ CONTROL OPTIONS FILE
END OF FILE?
NO
READ RECORD TYPE
*
YES
OUTPUT AS ONE SAS OBSERVATION
CREATE MACRO VARIABLES
RETURN TO MIP
TYPE=1?
NO
TYPE=2?
NO
TYPE=3?
NO
ERROR: INVALID RECORD TYPE
YES
YES
YES
PROCESS TYPE1
PROCESS TYPE2
PROCESS TYPE3
STOP

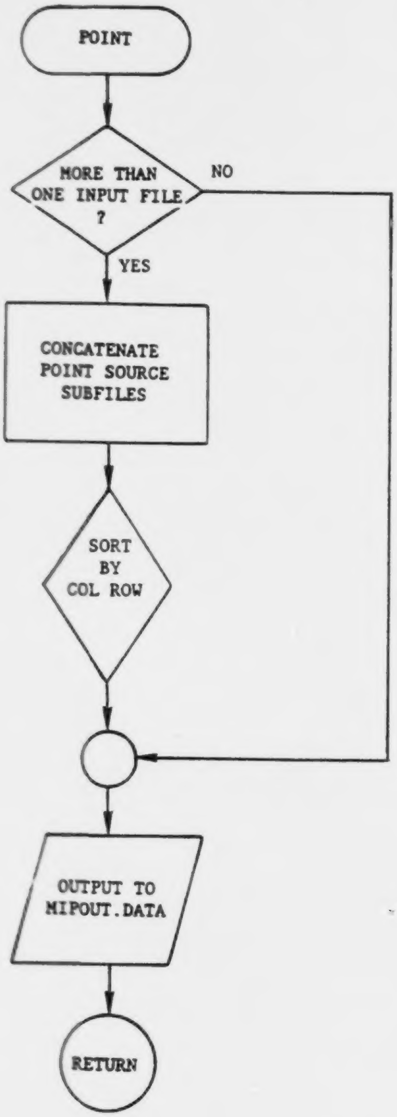
*DO NOT ADVANCE RECORD POINTER

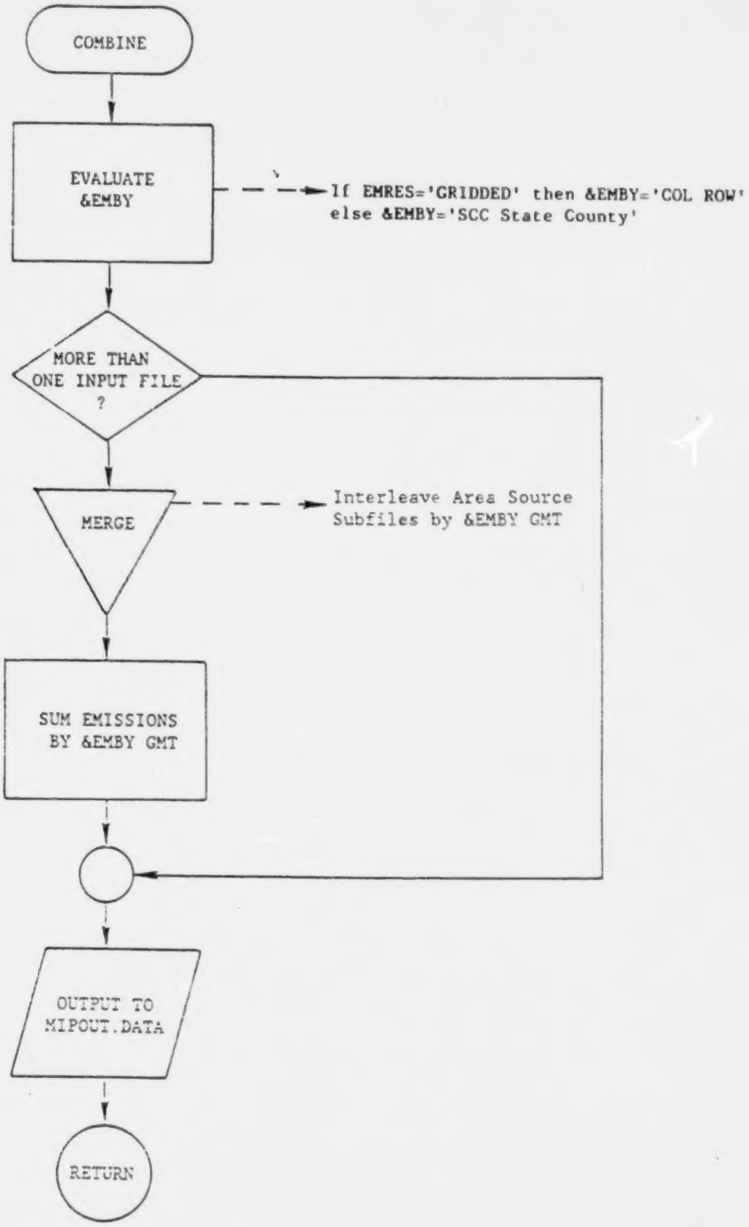

PROCESS TYPE1
READ RUN IDENTIFICATION AND CONTROL VARIABLES
DETAIL = 'S' or 'T'?
NO
ERROR: INVALID OPTION
STOP
YES
SOURCE = 'AS' or 'PS'?
NO
ERROR: INVALID SOURCE TYPE
STOP
YES
RETURN TO READ COF


PROCESS TYPE2
SOURCE = 'AS'?
NO
ERROR: INVALID RECORD FOR SOURCE TYPE
STOP
YES
READ POLLUTANT LIST
RETURN TO READ COF
PROCESS TYPE3
READ EMRES
EMRES = 'GRIDDED' OR 'NONGRIDDED'?
NO
ERROR: INVALID EMISSIONS RESOLUTION
STOP
YES
RETURN TO READ COF

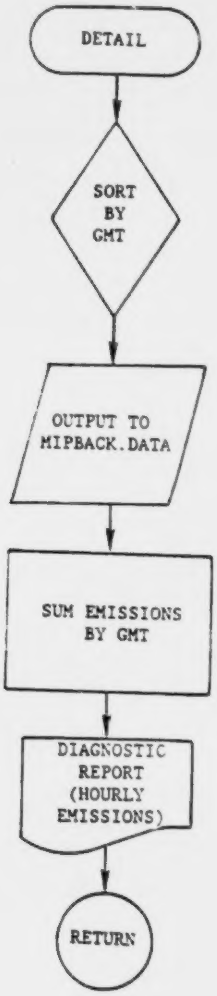
Reproduced from best available copy.

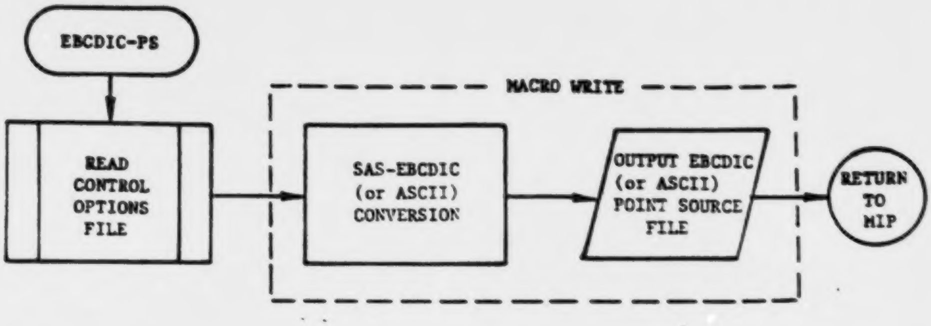
Model Input Preprocessor/EBCDIC Conversion--

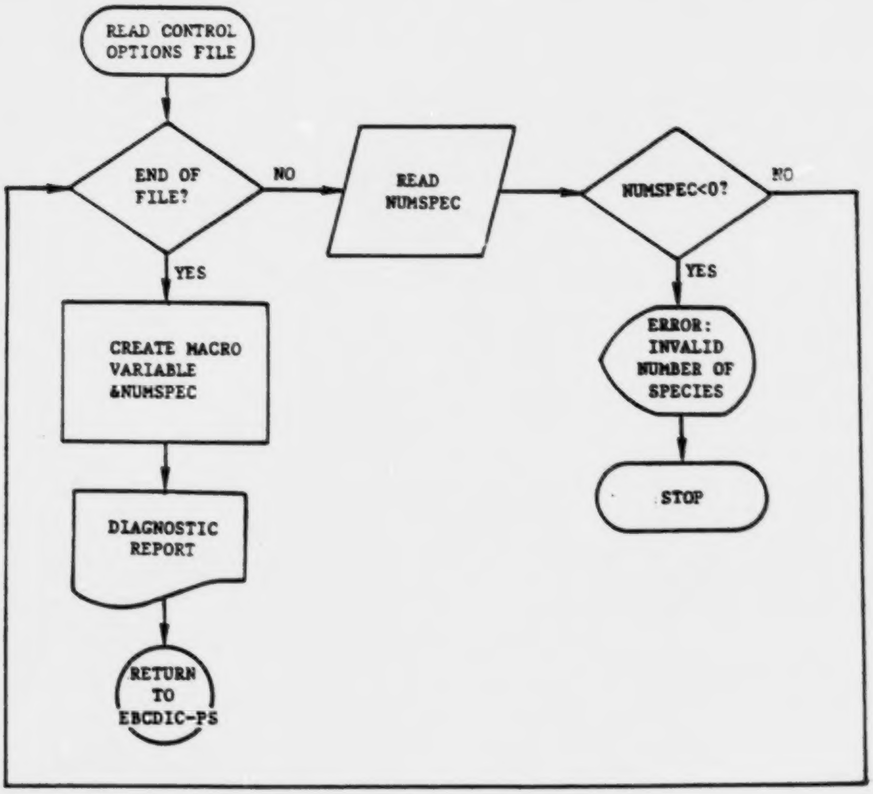

POINT
MORE THAN ONE INPUT FILE ?
NO
YES
CONCATENATE POINT SOURCE SUBFILES
SORT BY COL ROW
OUTPUT TO MIPOUT.DATA
RETURN

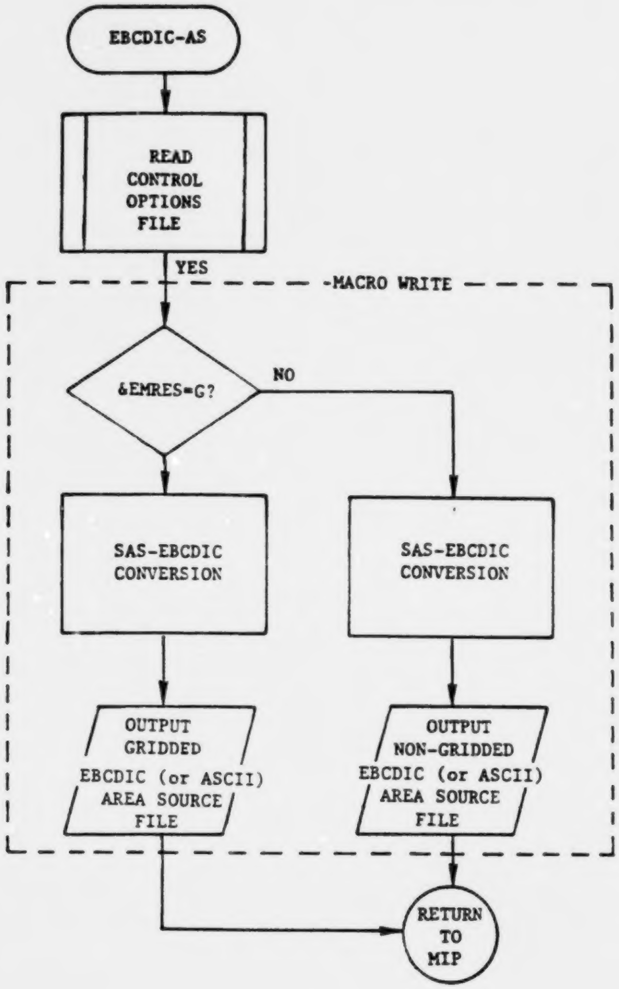

COMBINE
EVALUATE &EMBY
If EMRES='GRIDDED' then &EMBY='COL ROW' else &EMBY='SCC State County'
MORE THAN ONE INPUT FILE ?
MERGE
Interleave Area Source Subfiles by &EMBY GMT
SUM EMISSIONS BY &EMBY GMT
OUTPUT TO MIPOUT.DATA
RETURN

Model Input Preprocessor/EBCDIC Conversion-- Page 6 of 9

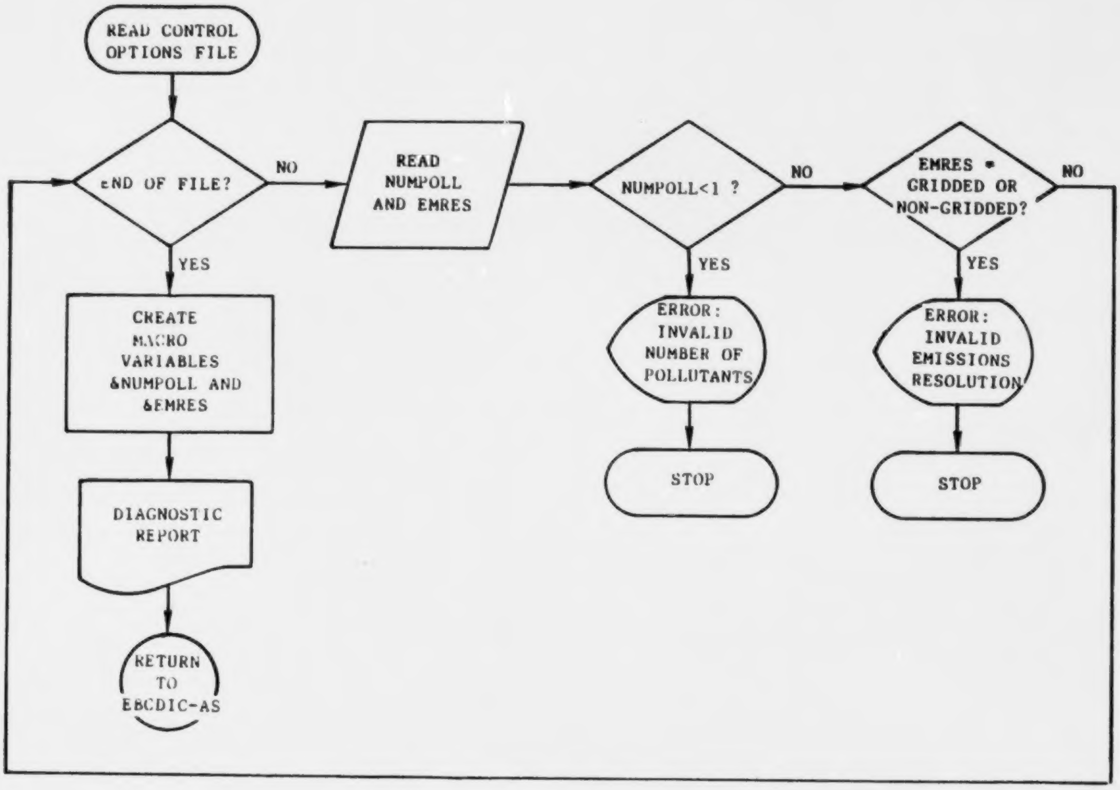

DETAIL
SORT BY GMT
OUTPUT TO MIPBACK.DATA
SUM EMISSIONS BY GMT
DIAGNOSTIC REPORT (HOURLY EMISSIONS)
RETURN


EBCDIC-PS
READ CONTROL OPTIONS FILE
MACRO WRITE
SAS-EBCDIC (or ASCII) CONVERSION
OUTPUT EBCDIC (or ASCII) POINT SOURCE FILE
RETURN TO MIP


READ CONTROL OPTIONS FILE
END OF FILE?
NO
YES
READ NUMSPEC
NUMSPEC<0?
NO
YES
CREATE MACRO VARIABLE &NUMSPEC
DIAGNOSTIC REPORT
RETURN TO EBCDIC-PS
ERROR: INVALID NUMBER OF SPECIES
STOP


EBCDIC-AS
READ CONTROL OPTIONS FILE
YES
-MACRO WRITE
&EMRES=G?
NO
SAS-EBCDIC CONVERSION
SAS-EBCDIC CONVERSION
OUTPUT GRIDDED EBCDIC (or ASCII) AREA SOURCE FILE
OUTPUT NON-GRIDDED EBCDIC (or ASCII) AREA SOURCE FILE
RETURN TO MIP

Model Input Preprocessor/EBCDIC Conversion--


READ CONTROL OPTIONS FILE
END OF FILE?
NO
READ NUMPOLL AND EMRES
NUMPOLL<1 ?
NO
EMRES = GRIDDED OR NON-GRIDDED?
NO
YES
CREATE MACRO VARIABLES &NUMPOLL AND &EMRES
YES
ERROR: INVALID NUMBER OF POLLUTANTS
YES
ERROR: INVALID EMISSIONS RESOLUTION
STOP
STOP
DIAGNOSTIC REPORT
RETURN TO EBCDIC-AS

SECTION 4

INPUT/OUTPUT FORMAT DESCRIPTIONS

The following section presents the format for the FREDS input and output data files. The formats are presented in tabular form, and in addition, sample diagnostic reports for each module are presented. The data files are stored either as SAS-formatted data sets or in standard EBCDIC format. Tables for SAS and EBCDIC file formats differ slightly, as described below.

EBCDIC file descriptions contain the beginning and end positions for each data value, the column width of the field, and a format which denotes whether the value is alphanumeric (A), integer (I) or floating point (F). A variable name and description is also provided; the name represents the name assigned the value upon input to FREDS. Values with a format of "F" contain additional information to indicate the location of the decimal point, and whether this decimal is explicit or implied. For example, a format of "F 8.5" denotes an eight-column value with an explicit decimal point and five places to the right of the decimal (e.g., 12.34567). Implied decimals are denoted by the symbol "V"; the format "F 8V5" would indicate an eight-digit string with an implied decimal after the third digit. Using this format, the EBCDIC string 12345678 would be input to FREDS as 123.45678.

SAS file descriptions are similar to those for EBCDIC files, with some differences. Since SAS file variables are generally referenced by name rather than position, no start/end record positions are given. The length attribute of a SAS variable is the number of bytes used to store its values. For alphnumeric variables, this length represents the column width of the value and can range from 1 to 200. For numeric variables, lengths range from 2 to 8 depending on the value represented. While 8 bytes represents the SAS default, numeric variables which are generally small integers (such as state, county and SAROAD codes) can be stored in fewer bytes, reducing storage space requirements. As in EBCDIC files, variable type is denoted as A, I, or F. While SAS makes no technical distinction between integer and floating point numbers, this additional information is provided to assist the user in construction of files with similar formats.

HYDROCARBON PREPROCESSOR

The following pages present formats for the various data files associated with HCPREP. For EBCDIC data sets, the beginning and end positions of each variable are provided as well as the variable name assigned upon input to SAS. SAS-formatted input files are generally referenced by variable name only, and therefore SAS file descriptions do not contain information on record positions. The following files are documented in this section:

- Control Options File
- Point Source Emissions File
- Area Source Annual Emissions/Category File
- Area Source Annual County File
- Weight Percent - Profile File
- Point or Area Source SCC - Profile File
- HCPREP Diagnostic Report

FILE NAME: HCPREP Control Options File

RECORD NAME: Control Record

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	2	2	A	SCE	Source Type (Point or Area)
4	8	5	I	HC_CODE	SAROAD Code of Input Hydrocarbon Species (43101 or 43104)
10	10	1	A	DETAIL	Level of Report Detail ('S' or 'D')
12	15	4	A	SASMEM	Member Name for SAS Data Set
17	76	60	A	RUN_ID	Run Identification Header

Emissions Files

The input and output annual emissions files are virtually identical in format. HCPREP adds one new variable to the emissions file, ORIG_HC, which represents the original hydrocarbon emission value for possible future reference. Because of their similarity, only one format (corresponding to both the input and output files) is depicted here. The Area Source Annual County File is not processed by HCPREP. The variable descriptions and file format are provided, however, since this file in conjunction with the Area Source Annual Emissions/Category File represents the complete Annual Area Source Master File.

FILE NAME: Point Source Emissions File RECORD NAME: Point Source Record

Page 1 of 3

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	STATE	NEDS State Code
		8	I	COUNTY	NEDS County Code
		8	I	AQCR	Air Quality Control Region Code
		4	A	PLANT_ID	NEDS Plant ID Code
		8	I	CITY	NEDS City Code
		8	I	UTM_ZONE	UTM Zone
		1	A	OWNER	Ownership Code (P-Private, L-Local Gov., S-State Gov., F-Federal Gov., U-Utility)
		12	A	CONTACT	Person Responsible for Pollution Control
		40	A	NAMEADD	Plant Name and Mailing Address
		54	A	NEDPLCOM	NEDS P7 Plant Comment
		2	A	POINT_ID	NEDS Point ID
		8	I	SIC	Standard Industrial Classification Code
		8	I	IPP	NEDS Implementation Planning Process Code
		8	F	UTMX	UTM Horizontal Coordinate
		8	F	UTMY	UTM Vertical Coordinate
		8	F	LAT	Latitude, Degrees
		8	F	LON	Longitude, Degrees
		8	I	WINTHRU	Winter Thruput Percent
		8	I	SPRTHRU	Spring Thruput Percent
		8	I	SUMTHRU	Summer Thruput Percent
		8	I	FALTHRU	Fall Thruput Percent
		8	I	HOURS	Hours per Day in Operation
		8	I	DAYS	Days per Week in Operation
		8	I	WEEKS	Weeks per Year in Operation
		8	I	BOILCAP	Boiler Design Capacity, Million Btu per Hour

FILE NAME: Point Source Emissions File RECORD NAME: Point Source Record

Page 2 of 3

Record Position		SAS			
First	Last	Length (Bytes)	Type	Name	Variable Description
		8	I	SPHEAT	Percent of Fuel used for Space Heating
		8	F	STACK_HT	Stack Height, ft
		8	F	STACK_DI	Stack Diameter, ft
		8	F	STACK_TP	Stack Temperature, Degrees F
		8	F	FLOW	Exhaust Flow Rate, CFM
		8	F	VELOCITY	Velocity, ft per second
		8	F	PLUME_HT	Plume Height, ft
		4	A	PTSCOMST	Range of Points Using Common Stack
		54	A	NEDPTCOM	NEDS P7 Point Comment
		8	I	SCC	SCC-Source Classification Code
		8	I	THRUPUT	Fuel Process Rate (Thruput)-Ann. Operating Rate
		8	I	MAXRATE	Maximum Hourly Design Rate
		8	F	SCON	Sulfur Content Percent
		8	F	ASHCON	Ash Content Percent
		8	I	HEATCON	Heat Content in Millions of Btu
		8	I	CONFID	Confidentiality (1-Yes, 2-No)
		1	A	SCECODE	SCC Process Cateogry (B-Boiler, P-Process, C-Other Combustion, S-Solid Waste)
		54	A	NEDSCCOM	NEDS P7 SCC Comment
		8	I	NUMPOLL	Number of Pollutants
		8	I	SAROAD1-15	Pollutant ID
		3	A	POLLN1-15	Pollutant Name
		8	I	CONPRI1-15	Primary Control Equipment
		8	I	CONSEC1-15	Secondary Control Equipment
		8	I	CONEFF1-15	Estimated Control Efficiency Percent

FILE NAME: Point Source Emissions File RECORD NAME: Point Source Record

Page 3 of 3

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	I	ESTMET1-15[b]	Estimation Method Used to Ascertain Emissions Estimated
		8	F	EMF1-15	Emission Factor (units dependent upon SCC)
		8	F	EMISS1-15	Apportioned Emissions in tons/year
		8	I	YRPLANT	Year Plant Information Last Updated
		8	I	YRPOINT	Year Point Information Last Updated
		8	I	YRCONTR	Year Control Information Last Updated
		8	I	YREMISS	Year Emissions Information Last Updated
		8	I	YRPROD	Year Product Information Last Updated
		8	I	YRREG	Year Regulatory Information Last Updated
		8	F	ORIG_HC[c]	NEDS Original Hydrocarbon Emissions

Note: The variables SAROAD through EMISS are repeated 'NUMPOLL' (up to 15 times), once for each pollutant.

[a] First/Last positions refer to EBCDIC files; SAS variables are commonly referenced by name, rather than record position.

[b] A listing of NEDS point source estimation methods is given an Appendix H.

[c] This variable is created by HCPREP and exists only in the HCPREP output emissions file.

FILE NAME: Area Source Annual Emissions/Category File

RECORD NAME: Area Source Emissions Record

Page 1 of 1

Record Position		SAS			
First	Last	Length (Bytes)	Type	Variable Name	Description
N/A[a]		2	I	STATE	AEROS State Code
		4	I	COUNTY	AEROS County Code
		4	I	SCC	Area Source Category Code
		8	I	NUMPOLL	Number of Pollutants
		4	I	SAROAD1-15	Pollutant ID
		8	F	EMISS1-15	Pollutant Emissions (tons/year)
		8	F	EMF1-15	Pollutant Emission Factors
		8	F	ORIG_HC[b]	Original (Input) Hydrocarbon Emissions

---

[a] First/last positions refer to EBCDIC files; SAS variables are commonly referenced by name rather than record position.

[b] This variable is created by HCPREP and exists only in the HCPREP output file.

FILE NAME: Area Source Annual
County File

RECORD NAME: County Record

Page 1 of 2

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		2	I	STATE	AEROS State Code
		4	I	COUNTY	AEROS County Code
		4	I	AQCR	Air Quality Control Region Code
		28	A	AREANAME	County Name
		8	I	POPRURAL	% Population Rural
		8	I	POPDENS	County Population Density
		8	F	SCONA	Sulfur % Anthracite Coal
		8	F	SCONB	Sulfur % Bituminous Coal
		8	F	SCOND	Sulfur % Distillate Oil
		8	F	SCONR	Sulfur % Residual Oil
		8	F	ASHCONA	Ash % Anthracite Coal
		8	F	ASHCONB	Ash % Bituminous Coal
		8	I	TSPSIP	Particulate Emission Estimate (10^2 tons/year)
		8	I	SO2SIP	SO_2 Emission Estimate (10^2 tons/year)
		8	I	NOXSIP	NO_x Emission Estimate (10^2 tons/year)
		8	I	HCSIP	HC Emission Estimate (10^2 tons/year)
		8	I	COSIP	CO Emission Estimate (10^2 tons/year)
		8	I	GFLDV	Gas, Light Vehicle (10^3 gal)
		8	I	GFHDV	Gas, Heavy Vehicle (10^3 gal)
		8	I	DFHDV	Diesel, Heavy Vehicle (10^3 gal)
		8	I	VMTLAR	Vehicle Miles Travelled, Limited Access Roads (10^3)
		8	I	VMTRR	Vehicle Miles Travelled, Rural Roads (10^3)
		8	I	VMTSR	Vehicle Miles Travelled, Suburban Roads (10^3)

FILE NAME: Area Source Annual County File

RECORD NAME: County Record

Page 2 of 2

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	I	VMTUR	Vehicle Miles Travelled, Urban Roads (10^3)
		2	I	CATYEAR	Year of Record

---

[a] First/last positions refer to EBCDIC files; SAS variables are commonly referenced by name rather than record position.

FILE NAME: Weight Percent - Profile File

RECORD NAME: Weight Percents

Record Position First	Record Position Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	PROF_NO	Speciation Profile Number
		8	F	CH4PCT	Weight Percent Methane in Profile
		8	F	HCHOPCT	Weight Percent Formaldehyde in Profile
		8	I	CH4FLG	Methane Adjustment Flag (0 or 1)
		8	I	HCHOFLG	Aldehyde Adjustment Flag (0 or 1)

FILE NAME: Point/Area Source SCC-Profile File

RECORD NAME: SCC Profile

Record Position First	Record Position Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	SCC	Source Classification Code
		8	I	PROF_NO	Speciation Profile Number
		1	A	ASSIGN	Profile Quality Indicator (Not Used)

---

[a] SAS variables are generally referenced by name rather than by record position.

```
DATE: 22MAR88      TIME: 20:30:31
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)                       HYDROCARBON PREPROCESSOR (HCPREP)
DIAGNOSTIC REPORT               FREDS 1985 TEST SERIES - U.S. POINT SOURCES             DETAILED LISTING
-------------------------------------------------- CONTROL FILE LISTING ------------------------------------------------

RUN IDENTIFICATION RECORD:

     SOURCE: PS  HC CODE: 43104  DETAIL: D  SAS FILE: TEST RUN ID: FREDS 1985 TEST SERIES - U.S. POINT SOURCES


                  EMISSION RECORDS WITH NO SPECIATION PROFILE          19:37 TUESDAY, MARCH 22, 1988

             OBS      SCC       STATE    COUNTY    PLANT_ID    POINT_ID

               1    10200104     20       0495       0004         04
               2    10200104     31       3060       0017         2N
               3    10200104     31       3060       0017         20
               4    10200104     31       3060       0017         2P
               5    10200104     39       0720       0011         01
               6    10200104     39       0720       0011         02
               7    10200104     39       0720       0011         03
               8    10200104     39       1660       0011         01
               9    10200104     39       1660       0011         02
              10    10200104     39       1960       0007         01
              11    10200104     39       1960       0007         02
              12    10200104     39       4700       0041         01
              13    10200104     39       4700       0041         02
              14    10200104     39       4700       0041         03
              15    10200104     39       4700       0074         01
              16    10200104     39       4700       0074         02
              17    10200104     39       4700       0074         03
              18    10200104     39       4940       0011         01
              19    10200104     39       4940       0011         02
              20    10200104     39       4940       0011         03


                    INVALID PROFILES IN SCC-PROFILE LISTING          19:37 TUESDAY, MARCH 22, 1988

                           OBS          SCC    PROF_NO
                            1            .        .
                            2            .        .
                            3            .        .
                            4     40722897     9045
                            5     40722898     9045


                    HYDROCARBON ADJUSTMENT DATA BY PROFILE          19:37 TUESDAY, MARCH 22, 1988

        OBS    PROF_NO     CH4PCT     HCHOPCT    CH4FLG    HCHOFLG    ADJ_FAC

          1       0         7.357      1.549       0          0        0.000
          2       1        11.000     42.000       0          1        0.420
          3       2         0.000     48.700       0          1        0.487
          4       3        56.000      8.000       0          1        0.080
          5       4         7.600      7.600       0          1        0.076
          6       5        82.800      0.000       0          1        0.000
          7       7        70.000     30.000       0          1        0.300
          8       8        11.600      0.000       0          1        0.000
          9       9        11.600      0.000       0          1        0.000
         10      11        45.300      0.000       0          1        0.000
         11      12        15.800      0.000       0          1        0.000
         12      13        73.300      0.000       0          1        0.000
         13      14         0.000      0.000       0          1        0.000
         14      16        11.100      0.000       0          1        0.000
         15      21         0.000      0.000       0          1        0.000
         16      22         0.000      0.000       0          1        0.000
         17      23         0.000      0.000       0          1        0.000
         18      24        21.300      0.000       0          1        0.000
         19      25        56.000      8.000       0          1        0.080
         20      26        15.700      0.000       0          1        0.000
```

Figure 4-1 HCPREP sample "detailed" diagnostic report.

QUALITY CONTROL MODULE

This section presents descriptions of files associated with Quality Control Module (QCM) processing as well as examples of QCM diagnostic reports. The descriptive names of associated files are as follows:

Files Input to QCM

- QCM Control Options File
- FREDS Files Input to QCM
    - FREDS Input File
    - FREDS Hydrocarbon Preprocessor Output
    - FREDS Model Data Extraction Module Output
    - FREDS Speciation Module Output
    - FREDS Spatial Allocation Module Output
    - FREDS Temporal Allocation Module Output
    - FREDS Model Input Preprocessor Output

Files Output from QCM

- Baseline and Intermediate Total Files
    - Baseline National Totals File[a]
    - Baseline State Totals File[a]
    - Baseline SCC Totals File[a]
    - Intermediate National Totals Files[a]
    - Intermediate State Totals Files[a]
    - Intermediate SCC Totals Files[a]
- Diagnostic Reports
    - National Totals Diagnostic Report
    - State Totals Diagnostic Report
    - SCC Totals Diagnostic Report
    - Temporal Allocation Factor Diagnostic Report

---

[a] File may also be used as a QCM input file.

Quality Control Module Control Options File

The elements contained in the QCM Control Options File provide the following information which determine the execution of the Quality Control Module:

- Step, country, and source parameters to determine which macro subroutine is to be executed,
- Maximum number of error messages to be printed in the diagnostic reports,
- Flag to indicate whether emissions comparison is to intermediate totals file or baseline totals file,
- Tolerances for checking pollutants and temporal allocation factors,
- Twenty SCCs for which to check national totals.

FILE NAME: QCM Control Options File RECORD NAME: First Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	3	3	A	STEP	FREDS processing step or module, (ONE-FREDS input file, HCP-Hydrocarbon Preprocessor, MDM-Model Data Extraction Module, SPM-Speciation Module, SAM-Spatial Allocation Module, TAM-Temporal Allocation Module, MIP-Model Input Preprocessor, SMA-Annual Data Set Sums, SMR-Resolved Data Set Sums)
5	7	3	A	COUNTRY	Emissions country of Origin, (USA-United States, CAN-Canada, ALL = United States & Canada)
9	9	1	A	SOURCE	Type of emissions source, (A-Area Source, P-Point Source)
11	15	5	I	MAXPRINT	Maximum number of diagnostic errors to be printed (0 to 99999)
17	19	3	A	COMPARE	Flag indicating emissions comparison to intermediate totals file (NEW) or baseline totals file (OLD).

FILE NAME: QCM Control Options File RECORD NAME: Second Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	8	8	F8.6	TOL1	Tolerance Factor for pollutant SO2
10	17	8	F8.6	TOL2	Tolerance Factor for pollutant SO4
19	26	8	F8.6	TOL3	Tolerance Factor for pollutant NOx

FILE NAME: QCM Control Options File RECORD NAME: Third Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	8	8	F8.6	TOL4	Tolerance Factor for pollutant CO
10	17	8	F8.6	TOL5	Tolerance Factor for pollutant HCL
19	26	8	F8.6	TOL6	Tolerance Factor for pollutant HF

FILE NAME: QCM Control Options File RECORD NAME: Fourth Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	8	8	F8.6	TOL7	Tolerance Factor for pollutant NH3
10	17	8	F8.6	TOL8	Tolerance Factor for pollutant TSP
19	26	8	F8.6	TOL9	Tolerance Factor for pollutant VOC

FILE NAME: QCM Control Options File RECORD NAME: Fifth Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	8	8	F8.6	TOL10	Tolerance Factor for pollutant THC

FILE NAME: QCM Control Options File RECORD NAME: Sixth Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	8	8	F8.6	SEATOL	Tolerance for seasonal temporal allocation factor
10	17	8	F8.6	DAYTOL	Tolerance for daily temporal allocation factor
19	26	8	F8.6	HOURTOL	Tolerance for hourly temporal allocation factor

FILE NAME: QCM Control Options File RECORD NAME: Seventh Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	8	8	I	SCC1	User specified SCC value
10	17	8	I	SCC2	User specified SCC value
19	26	8	I	SCC3	User specified SCC value
28	35	8	I	SCC4	User specified SCC value
37	44	8	I	SCC5	User specified SCC value

FILE NAME: QCM Control Options File RECORD NAME: Eighth Control Record

Record Position First	Last	Column Width	Format	Variable Name	Description
1	8	8	I	SCC6	User specified SCC value
10	17	8	I	SCC7	User specified SCC value
19	26	8	I	SCC8	User specified SCC value
28	35	8	I	SCC9	User specified SCC value
37	44	8	I	SCC10	User specified SCC value

FILE NAME: QCM Control Options File RECORD NAME: Ninth Control Record

Record Position First	Last	Column Width	Format	Variable Name	Description
1	8	8	I	SCC11	User specified SCC value
10	17	8	I	SCC12	User specified SCC value
19	26	8	I	SCC13	User specified SCC value
28	35	8	I	SCC14	User specified SCC value
37	44	8	I	SCC15	User specified SCC value

FILE NAME: QCM Control Options File RECORD NAME: Tenth Control Record

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	8	8	I	SCC16	User specified SCC value
10	17	8	I	SCC17	User specified SCC value
19	26	8	I	SCC18	User specified SCC value
28	35	8	I	SCC19	User specified SCC value
37	44	8	I	SCC20	User specified SCC value

FREDS Files Input to OCM

Initial Input File

Hydrocarbon Preprocessor Output

Model Data Extraction Module Output

Speciation Module Output

Spatial Allocation Module Output

Temporal Allocation Module Output

Model Input Preprocessor Output

Documentation for the formats of these files may be found throughout this section of the report.

Baseline and Intermediate National, State, and SCC Total Files

The Baseline and Intermediate National Totals File are single-record SAS files which contain the national totals for each of the annual pollutants. These totals are calculated from the initial FREDS input data for the Baseline Totals File or from an intermediate FREDS output file for an Intermediate Totals File. Since this is a SAS file, variables are referenced by name, rather than record position.

The variable names for pollutant totals in these files are SO2, SO4, NOX, HCl, HF, NH3, TSP, CO, VOC, and THC. The state totals files also contain the variable STATE (2 digit NEDS code) and the SCC totals files contain the variable SCC as an eight digit number.

The file naming conventions are as follows:

Baseline Totals Files -

userid/account.FREDS85.QCM.sourceS.country.levelTOT.SASDAT

Intermediate Totals Files -

userid/account.FREDS85.QCM.sourceS.country.levelstep.SASDAT

where "userid/account" is the EPA NCC user identification qualifier, "source" is the value of SOURCE input to the control options file, "country" is the value for COUNTRY input to the control options file, "level" is the level of resolution of the sums (NAT for National, STA for State, and SCC for SCC), and "step" is the value for STEP input to the control options file. For example, the U.S. point source Spatial Allocation Module Intermediate National Totals file output by user AAA with account number XXXXX would be stored in:

AAAXXXXX.FREDS85.QCM.PS.USA.NATSAM.SASDAT

Diagnostic Reports

Diagnostic reports are generated for examination of national, state, and SCC totals, as well as for temporal allocation factors. The reports are all similar in format, providing information to identify potential problems, followed by a statement indicating the total number of errors found.

The number of error messages output to a diagnostic report may be controlled through the variable MAXPRINT in the QCM control options file. Error messages will be output until the value of MAXPRINT is exceeded. In this case, the program continues processing the data and outputs the total number of errors found upon completion.

The file naming convention for diagnostic reports is as follows:

```
userid/account.FREDS85.QCM.sourceS.COUNTRY.levelstep.RPT
```

where "userid/account" is the EPA NCC user identification qualifier, "source" is the value of SOURCE input in the control options file, "country" is the value of COUNTRY input into the control options file, "level" is the level of resolution of the sums (NAT for national, STA for state, SCC for SCC and TAF for temporal allocation factors), and "step" is the value of STEP input into the control options file. For example, the national totals report output by user AAA with account number XXXXX for U.S. point sources at step TAM would be stored in :

```
AAAXXXXX.FREDS85.QCM.PS.USA.NATTAM.RPT
```

The following pages include examples of each of the diagnostic reports (Figures 4-2 through 4-5).

```
1985 NAPAP FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM                   03/24/88
QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR NATIONAL TOTALS
(FINAL TEST  U.S. POINT SOURCE SPATIAL ALLOCATION MODULE OUTPUT)
--------------------------------------------------------------------------------

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA ORIGINAL SO2=20839282   QASO2=20838937
DIFFERENCE= 345       TONS   (0      PERCENT OF ORIGINAL)    TOL1=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA SO4=546226              QASO4=546226
MEETS TOLERANCE, DIFFERENCE=0       TONS (  0     % OF ORIGINAL) TOL2=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA NOX=9564948             QANOX=9564942
MEETS TOLERANCE, DIFFERENCE=6       TONS (  0     % OF ORIGINAL) TOL3=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA CO=5577320              QACO=5577317
MEETS TOLERANCE, DIFFERENCE=3       TONS (  0     % OF ORIGINAL) TOL4=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA HCL=691996              QAHCL=691996
MEETS TOLERANCE, DIFFERENCE=0       TONS (  0     % OF ORIGINAL) TOL5=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA HF=108406               QAHF=108406
MEETS TOLERANCE, DIFFERENCE=0       TONS (  0     % OF ORIGINAL) TOL6=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA NH3=425478              QANH3=425478
MEETS TOLERANCE, DIFFERENCE=0       TONS (  0     % OF ORIGINAL) TOL7=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA ORIGINAL TSP=1790038    QATSP=1788401
DIFFERENCE= 1637      TONS   (0.09   PERCENT OF ORIGINAL)    TOL8=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA ORIGINAL VOC=2119858    QAVOC=2119831
DIFFERENCE= 27        TONS   (0      PERCENT OF ORIGINAL)    TOL9=1.00000E-06

SOURCE=P  STEP=SAM NATIONAL COUNTRY=USA ORIGINAL THC=2377315    QATHC=2377284
DIFFERENCE= 31        TONS   (0      PERCENT OF ORIGINAL)    TOL10=1.00000E-06
--------------------------------------------------------------------------------
TOTAL EXCEEDENCES OF ALL TOLERANCES ARE 4
TOTAL EXCEEDENCES, SO2: 1
                   SO4: 0
                   NOX: 0
                   CO:  0
                   HCL: 0
                   HF:  0
                   NH3: 0
                   TSP: 1
                   VOC: 1
                   THC: 1
```

Figure 4-2. Sample Quality Control Module national totals diagnostic error report.

```
1985 NAPAP FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM                     03/24/88
QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR STATE TOTALS
(FINAL TEST  U.S. POINT SOURCE SPATIAL ALLOCATION MODULE OUTPUT)
-----------------------------------------------------------------------------

SOURCE=P  STEP=SAM STATE=24      COUNTRY=USA SO2=152376       QASO2=152337
DIFFERENCE= 39       TONS   (0.03  PERCENT OF ORIGINAL)    TOL1=1.00000E-06

SOURCE=P  STEP=SAM STATE=24      COUNTRY=USA NOX=237084       QANOX=237078
DIFFERENCE= 6        TONS   (0     PERCENT OF ORIGINAL)    TOL3=1.00000E-06

SOURCE=P  STEP=SAM STATE=24      COUNTRY=USA CO=68923         QACO=68920
DIFFERENCE= 3        TONS   (0     PERCENT OF ORIGINAL)    TOL4=1.00000E-06

SOURCE=P  STEP=SAM STATE=24      COUNTRY=USA TSP=59434        QATSP=58291
DIFFERENCE= 1143     TONS   (1.92  PERCENT OF ORIGINAL)    TOL8=1.00000E-06

SOURCE=P  STEP=SAM STATE=24      COUNTRY=USA VOC=43139        QAVOC=43112
DIFFERENCE= 27       TONS   (0.06  PERCENT OF ORIGINAL)    TOL9=1.00000E-06

SOURCE=P  STEP=SAM STATE=24      COUNTRY=USA THC=46489        QATHC=46459
DIFFERENCE= 31       TONS   (0.07  PERCENT OF ORIGINAL)    TOL10=1.00000E-06

SOURCE=P  STEP=SAM STATE=32      COUNTRY=USA SO2=244844       QASO2=244538
DIFFERENCE= 306      TONS   (0.12  PERCENT OF ORIGINAL)    TOL1=1.00000E-06

SOURCE=P  STEP=SAM STATE=32      COUNTRY=USA TSP=14612        QATSP=14119
DIFFERENCE= 494      TONS   (3.38  PERCENT OF ORIGINAL)    TOL8=1.00000E-06
-----------------------------------------------------------------------------
TOTAL EXCEEDENCES OF ALL TOLERANCES ARE 8
TOTAL EXCEEDENCES, SO2: 2
                   SO4: 0
                   NOX: 1
                   CO:  1
                   HCL: 0
                   HF:  0
                   NH3: 0
                   TSP: 2
                   VOC: 1
                   THC: 1
```

Figure 4-3. Sample Quality Control Module state totals diagnostic error report.

```
1985 NAPAP FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM                      02/24/88
QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR SCC TOTALS
(TEST V01 U.S. POINT SOURCE TEMPORAL ALLOCATION MODULE OUTPUT)
------------------------------------------------------------------------------

SOURCE-P  STEP-TAM SCC-10200501  COUNTRY-USA SO2-19118        QASO2-19115
DIFFERENCE- 3        TONS   (0.02  PERCENT OF ORIGINAL)    TOL1-1.00000E-06

SOURCE-P  STEP-TAM SCC-10200501  COUNTRY-USA NOX-16966        QANOX-16965
DIFFERENCE- 1        TONS   (0.01  PERCENT OF ORIGINAL)    TOL3-1.00000E-06
------------------------------------------------------------------------------
TOTAL EXCEEDENCES OF ALL TOLERANCES ARE 2
TOTAL EXCEEDENCES, SO2: 1
                   SO4: 0
                   NOX: 1
                   CO:  0
                   HCL: 0
                   HF:  0
                   NH3: 0
                   TSP: 0
                   VOC: 0
                   THC: 0


SCCs Totaled  10100501  10100504  10100505  10100601  10100602
              10200101  10200104  10200501  10200504  10200601
              31000401  31000403  39000599  39000699  39000199
              40100101  40100201  40100221  40100251  40200101
```

Figure 4-4. Sample Quality Control Module SCC totals diagnostic error report.

```
1985 NAPAP FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM                    02/26/88
QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR  TEMPORAL ALLOCATION FACTORS
(TEST V01 U.S. POINT SOURCE TEMPORAL ALLOCATION MODULE OUTPUT)
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------

SOURCE=P  STEP=TAM COUNTRY=USA QADAYWIN=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=01 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYSPR=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=01 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYSUM=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=01 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYFAL=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=01 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYWIN=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=02 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYSPR=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=02 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYSUM=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=02 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYFAL=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=02 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYWIN=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=03 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYSPR=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=03 SCC=10100212

SOURCE=P  STEP=TAM COUNTRY=USA QADAYSUM=1.66666  DAYTOL=0.001
DIFFERENCE FROM 1.000 IS  0.6666667
STATE=34  COUNTY=3420 PLANT_ID=0015  POINT_ID=03 SCC=10100212
--------------------------------------------------------------------------------
TOTAL EXCEEDENCES OF ALL TOLERANCES ARE 11
TOTAL EXCEEDENCES, SEASONAL (AT 0.001) :    0
                   DAILY (AT 0.001)    :   11
                   HOURLY (AT 0.001)   :    0
```

Figure 4-5. Sample Quality Control Module temporal allocation factor diagnostic error report.

MODEL DATA EXTRACTION MODULE

This section presents descriptions of the files associated with MDEM and the diagnostic report generated. The descriptive names of the files are:

- MDEM Control Options File
- Annual Point Source Master File
- Annual Area Source Master File
- Point Source Emissions Files
- Area Source Emissions Files
- MDEM Diagnostic Report

MDEM Control Options File

MDEM control options are specified in an EBCDIC file. Processing information is contained on three record types for point sources: Run Identification, SIC/SCC Definition and Major/Minor Point Source Definition records. For area sources, three record types are also specified in the control file: Run Identification, SCC Definition, and Pollutant Identification records. The Run Identification record, required for processing either point or area source emissions files, informs MDEM which file type is to be processed in the program. "AS" indicates an area source file is being processed, while "PS" identifies a point source file. An area of the record is reserved for requesting the level of detail of the diagnostic report, including a printout of the reduced emissions files. For point sources, a minor flag is included for creation of major/minor point source files. The remainder of the Run Identification record is used to assign a label to the particular MDEM run, which will appear on the diagnostic report. Only one Run Identification record may be used per run.

The SIC/SCC or SCC record identifies industry categories for sources to be output to separate files. For each user-defined SIC/SCC combination, a file is created that contains only source records that correspond to each specified category. DD labels for subfiles are also specified on this record. If a source record does not match a specified SIC/SCC combination, it is output to a miscellaneous file. Up to 24 SIC/SCC combinations may be specified for point source files and 49 SCCs for area source files. For the 1985 NAPAP Modeling inventory, industry specific subfiles will not be created.

The Major/Minor Point Source Definition record specifies the pollutant SAROAD codes and emission limits for determining whether a point source should be considered major or minor. One limit may be entered for each pollutant SAROAD code. MDEM can accommodate up to 15 limit specifications. DD labels for the subfiles are also specified on this record. This record is not included for an area source run. This option will not be employed for 1985 point source data.

The Pollutant Identification record specifies the number of annual area source pollutants and the pollutant SAROAD codes and names. These records are used to extract the annual pollutants from the variables SAROAD1-15 and EMISS1-15. The following pages contain descriptions of the four different Control Options File records.

FILE NAME: MDEM Control Options File

RECORD NAME: Run Identification Record - Point and Area Sources

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (=1)
3	4	2	A	SOURCE	Area (='AS') or Point Source (='PS') Identifier
6	6	1	A	DETAIL	Detail of File Listing (='S', ='D', or for area sources only, ='T')
8	8	1	A	MINOR	Minor Flag[a] (='Y' or ='N')
10	71	62	A	RUN_ID	Run Identification Header

---

[a] For area source runs, column 8 is not used.

FILE NAME: MDEM Control Options File RECORD NAME: SIC/SCC Definition Record - Point and Area Sources

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (=2)
3	6	4	I	SUBSIC (INDX2)	SIC Code[a]
8	15	8	I	SUBSCC (INDX2)	SCC Code
17	24	8	A	SUBDD	DD Labels for SIC/SCC Subfiles

FILE NAME: MDEM Control Options File RECORD NAME: Major/Minor Source Definition Record - Point Sources

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (=3)
3	7	5	I	LIM_ID (INDX3)	SAROAD Code[b]
9	15	7	I	LIM_TH (INDX3)	Emissions Limit for Pollutant (tons/yr)
17	24	8	A	SUBDD	DD Labels for Files or Subfiles

---

[a] For area source runs, column 3-6 are not used.
[b] A listing of pollutant SAROAD codes is given in Appendix H.

FILE NAME: MDEM Control Options File

RECORD NAME: Pollutant Identification Record - Area Sources

Page 1 of 1

Record Position: Line 1

First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (-3)
3	4	2	I	ANN	Number of Annual Pollutants ($1 \geq$ ANN ≤ 15)

Record Position: Lines 2-(ANN+1)[a]

First	Last	Column Width	Format	Variable Name	Description
1	1	1	b	TYPE	Record Identification (blank)
2	6	5	I	SAROAD	Pollutant SAROAD Code[c]
8	15	8	A	NAME	Pollutant Name[d]

---

[a] Repeat for the number of annual pollutants.

[b] Field must be left blank.

[c] A listing of pollutant SAROAD codes is given in Appendix H.

[d] Pollutant names specified for 1985 NAPAP processing are as follows: ASO_2, ASO_4, ATSP, ANO_x, ACO, ANH_3, AVOC, and ATHC, respectively.

Annual Point Source Master File

The preprocessed point source SAS file output by HCPREP contains one record per SCC, State, County, Plant ID, Point ID combination. This file serves as the annual point source master file as well as input to MDEM-PS. MDEM processing for this file further reduces the data by dropping variables not referenced by FREDS or required for regional modeling. The point source file format is given with the HCPREP I/O formats.

Annual Area Source Master File

The preprocessed area source SAS file output by HCPREP contains one record for each SCC, State, and County combination. This file in conjunction with the Area Source Annual County File serves as the annual area source master file as well as input to MDEM-AS.

A complete format list of the annual area source master file is included with the HCPREP file description. For FREDS processing, MDEM reduces the number of pollutant emissions variables from 30 to 15 by extracting pollutants contained in the arrays EMISS1-15 and SAROAD1-15 into single variables defined by pollutant name. In addition, extraneous information in the annual master file is dropped to minimize file overhead. Variables extracted from the master file to be used in FREDS are assigned names per the following pages.

Point Source Emissions File(s) (Output)

The Point Source Emissions File(s) contains emissions and stack data for annual point source pollutants. The MDEM has the capability of creating one or more point source emissions files or subfiles (major and minor point sources based on user defined emission units) for each user specified SIC/SCC combination specified in the Control Options File. For 1985 processing, this application will not be used, i.e., only one point source file is output by MDEM. Each output file is SAS formatted and contains one record per point. The format of the MDEM point source output file follows.

Area Source Emissions File (Output)

The Area Source Emissions File contains one record type in SAS file format. Each record contains area source identification, an emission category (SCC), and apportioned emissions data. Up to 15 pollutants are included per record. MDEM places no limit to the number of area source categories per county. The file format is listed in the following pages. For the 1985 NAPAP inventory, three area source files may be output by MDEM, one containing all pollutants, one containing THC, VOC and NO_x emissions data, and one containing emissions data for other pollutants, (e.g. SO_2, SO_4, TSP, CO, HCl, HF, and NH_3). If desired, SCC defined subfiles may be created by specifying the appropriate options on the SIC/SCC Definition Record of the MDEM Control Options File.

FILE NAME: Point Source Emissions File RECORD NAME: Major/Minor Point Source Record

Page 1 of 2

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		8	I	AQCR	Air Quality Control Region
		4	A	PLANT_ID	Plant Identification Code
		2	A	POINT_ID	Point Identification Code
		8	F	UTM_ZONE	UTM Zone
		8	F	UTMX	UTM Horizontal Coordinate
		8	F	UTMY	UTM Vertical Coordinate
		8	F	LAT	Latitude, Degrees
		8	F	LON	Longitude, Degrees
		8	I	SIC	SIC Code
		8	I	SCC	SCC Code
		8	F	WINTHRU	Winter Throughput Percent
		8	F	SUMTHRU	Summer Throughput Percent
		8	F	SPRTHRU	Spring Throughput Percent
		8	F	FALTHRU	Fall Throughput Percent
		8	F	HOURS	Hours per Day
		8	F	DAYS	Days per Week
		8	F	WEEKS	Weeks per Year
		8	F	NUMPOLL	Number of Pollutants
		8	F	SAROAD1-15	Pollutant ID
		8	F	EMISS1-15	Annual Emissions (tons/yr)

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name.

FILE NAME: Point Source Emissions File

RECORD NAME: Major/Minor Point Source Record

Page 2 of 2

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	PLUME_HT	Plume Height (ft)
		8	F	STACK_TP	Stack Temperature (°F)
		8	F	STACK_HT	Stack Height (ft)
		8	F	STACK_DI	Stack Diameter (ft)
		8	F	FLOW	Exhaust Flow Rate (ft^3/min)
		8	F	VELOCITY	Exit Velocity (ft/min)
		8	F	CONEFF1-15	Estimated Control Efficiency (%)
		8	F	ESTMET1-15	Estimation Method[b]

NOTE: SAROAD, EMISS, CONEFF and ESTMET will be repeated NUMPOLL (up to 15) times once for each pollutant.

[b] A listing of NEDS point source estimation methods is given in Appendix H.

FILE NAME: Area Source Emissions File (All pollutants) RECORD NAME: Area Source Record

Page 1 of 1

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		2	I	STATE	AEROS State Code
		4	I	COUNTY	AEROS County Code
		4	I	SCC	Area Source Category Code[b]
		8	F	ASO_2	Emissions for SO_2 (tons/yr)
		8	F	ASO_4	Emissions for SO_4 (tons/yr)
		8	F	ATSP	Emissions for TSP (tons/yr)
		8	F	ACO	Emissions for CO (tons/yr)
		8	F	ANO_x	Emissions for NO_x (tons/yr)
		8	F	ANH_3	Emissions for NH_3 (tons/yr)
		8	F	AVOC	Emissions for VOC (tons/yr)
		8	F	ATHC	Emissions for THC (tons/yr)

---

[a] SAS Files are variable defined and, thus, variables in SAS data sets are referenced by name.

[b] Area Source Category codes for U.S. and Canadian area sources are given in Appendix H.

FILE NAME: Area Source THC/NO_x Emissions File RECORD NAME: Area Source Record

Page 1 of 1

Record Position		SAS Length (Bytes)	Type	Variable Name	Description
First	Last				
N/A[a]		2	I	STATE	AEROS State Code
		4	I	COUNTY	AEROS County Code
		4	I	SCC	Area Source Category Code[b]
		8	F	ANO_x	Emissions for NO_x (tons/yr)
		8	F	AVOC	Emissions for VOC (tons/yr)
		8	F	ATHC	Emissions for THC (tons/yr)

---

[a] SAS Files are variable defined and, thus, variables in SAS data sets are referenced by name.

[b] Area Source Category codes for U.S. and Canadian area sources are given in Appendix H.

FILE NAME: Area Source TSP/SO_2 Emissions File RECORD NAME: Area Source Record

Page 1 of 1

Record Position					
First	Last	SAS Length Length	Type	Variable Name	Description
N/A[a]		2	I	STATE	AEROS State Code
		4	I	COUNTY	AEROS County Code
		4	I	SCC	Area Source Category Code[b]
		8	F	ASO_2	Emissions for SO_2 (tons/yr)
		8	F	ASO_4	Emissions for SO_4 (tons/yr)
		8	F	ACO	Emissions for CO (tons/yr)
		8	F	ATSP	Emissions for TSP (tons/yr)
		8	F	ANH_3	Emissions for NH_3 (tons/yr)

---

[a] SAS Files are variable defined and, thus, variables in SAS data sets are referenced by name.

[b] Area Source Category codes for U.S. and Canadian area sources are given in Appendix H.

MDEM Diagnostic Report

The MDEM diagnostic report will vary depending on whether MDEM is processing point or area sources and the level of detail specified. For both source types, run date and time, title, control options, the number of emission sources, the number of pollutant identification records processed, and the number of zero emissions records deleted will appear on the diagnostic report. A total count of records processed plus a listing of any error messages are included with the SAS summary. For point sources, the number of records in each industry subfile (SIC/SCC combination) divided into major and minor sources will be included with messages on the report. If emissions totals are requested for area source emissions, these will also be output. If a detailed report is requested, emissions file listings will be printed. Sample diagnostic reports were generated using a subset of the 1985 NAPAP data base. A summary report for MDEM point source processing is illustrated in Figure 4-6. Figure 4-7 presents a detailed report for area source processing.

```
DATE: 22MAR88       TIME: 21:05:49
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)                                    MODEL DATA EXTRACTION MODULE (MDEM)
DIAGNOSTIC REPORT                  1985 NAPAP INVENTORY-POINT SOURCES TEST 85 FREDS USA          DETAILED LISTING
--------------------------------------------------- CONTROL FILE LISTING ----------------------------------------

RUN IDENTIFICATION RECORD:

    SOURCE: PS  DETAIL: D  MINOR FLAG: N  RUN ID: 1985 NAPAP INVENTORY-POINT SOURCES TEST 85 FREDS USA

---------------------------------------------------- EMISSIONS FILE SUMMARY -------------------------------------

                                  TOTAL ZERO EMISSION POINT SOURCE RECORDS DELETED
                                 ------------------------------------------------------
                                  46253
                                  TOTAL POINT SOURCE RECORDS READ INTO EMISSIONS FILE
                                 ------------------------------------------------------
                                 127693


                              EMISSION SUBFILE-MISCELLANEOUS MAJOR POINT SOURCES      20:45 TUESDAY, MARCH 22, 1988

   P    P               S   S    S          P                                                U     V
   L    O               T   T    T          L  W  S  S  F                                    T     E
   A    I               A   A    A          U  I  P  U  A              C                     M     L
   N    N               C   C    C          M  N  R  M  L  H    W  S   O                     _     O
   T    T   U     U     K   K    K       F  E  T  T  T  T  O D  E  T   U             A       Z     C
O  _    _   T     T     _   _    _       L  _  H  H  H  H  U A  E  A   N      S      C  S    O     I       L
B  I    I   M     M     H   D    T       O  H  R  R  R  R  R Y  K  T   T      C      C  I    N     T       A
S  D    D   X     Y     T   I    P       W  T  U  U  U  U  S S  S  E   Y      C      R  C    E     Y       T

1 0195 03 652.3 4559.2 498 14.0 300 1175000 0 25 25 25 25 24 7 52  7  265 10100101  43 4911 18 127.226 41.1715  73.18
2 0054 01 386.1 4409.2 200 12.5 300  433176 0 26 26 20 28  . .  . 39 4700 10100101 196 4911 18  58.835 39.8263  76.33
3 0014 01 410.2 4561.5 188 11.3 350  113131 0 26 25 24 25  . .  . 39 5220 10100101 151 4911 18  18.803 41.2015  76.07
4 0002 01 346.1 4522.2 300 15.0 325  468085 0 22 29 27 22  . .  . 39 8320 10100101 195 4911 18  44.151 40.8380  76.82
5 0002 02 346.1 4522.2 300 15.0 325  468085 0 22 27 29 22  . .  . 39 8320 10100101 195 4911 18  44.151 40.8380  76.82
6 0002 03 346.1 4522.2 300 15.0 325  468085 0 22 29 27 22  . .  . 39 8320 10100101 195 4911 18  44.151 40.8380  76.82
7 0002 04 346.1 4522.2 300 15.0 325  468085 0 22 29 27 22  . .  . 39 8320 10100101 195 4911 18  44.151 40.8380  76.82
8 0005 11 400.2 3680.0 328 11.3 150  270777 0 25 25 25 25 24 7 52 45  810 10100101  22 2621 15  45.004 33.2562  94.07
9 0010 10 510.9 5177.8 470 24.0 300 1500000 0 25 25 25 25 24 1 15 49 1100 10100101 193 4911 10  55.267 46.7555 122.85

                           C C C C C C
   C  C  C  C    C C C C C O O O O O O                                                                     E E E
   O  O  O  O    O O O O O N N N N N N     E       E      E       E       E      E     E      E       E   M M M
   N  N  N  N    N N N N N E E E E E E     M       M      M       M       M      M     M      M       M   I I I
   E  E  E  E    E E E E E F F F F F F     I       I      I       I       I      I     I      I       I   S S S
O  F  F  F  F    F F F F F F F F F F F     S       S      S       S       S      S     S      S       S   S S S
B  F  F  F  F    F F F F F 1 1 1 1 1 1     S       S      S       S       S      S     S      S       S   1 1 1
S  1  2  3  4    5 6 7 8 9 0 1 2 3 4 5     1       2      3       4       5      6     7      8       9   0 1 2

1  0  0  0 97.0  0 . . . . . . . . . . 10563.6  6964.5  26.987 929.00  231.70 352.13 69.652 26.987    .   . . .
2  0  0  0 99.9  0 . . . . . . . . . .  6910.3  2062.8   8.153  36.71   70.89 131.79 26.069  8.153    .   . . .
3  0  0  0 99.9  0 . . . . . . . . . .  2578.8  1829.8   6.990  14.00   60.75  92.58 18.312  6.990    .   . . .
4  0  0  0 99.9  0 . . . . . . . . . .   557.1   243.3   0.703   0.86    7.03  61.29 12.123  0.703    .   . . .
5  0  0  0 99.9  0 . . . . . . . . . .   557.1   243.3   0.703   0.86    7.03  61.29 12.123  0.703    .   . . .
6  0  0  0 99.9  0 . . . . . . . . . .   557.1   243.3   0.703   0.86    7.03  61.29 12.123  0.703    .   . . .
7  0  0  0 99.9  0 . . . . . . . . . .   557.1   243.3   0.703   0.86    7.03  61.29 12.123  0.703    .   . . .
8 99 99 99 95.0 99 . . . . . . . . . .     0.0  2922.0 258.000 417.00 4157.00 258.00   .      .       .   . . .
9  0  0  0  5.0  0 . . . . . . . . . .    95.8    51.8   0.000 457.11    1.58   2.73  0.540  0.000    .   . . .

                        E E E E E E                                                     S S S S S S
  E E E E E E E E E E E S S S S S S   S     S     S     S     S     S     S     S     S A A A A A A N
  M M S S S S S S S S S T T T T T T   A     A     A     A     A     A     A     A     A R R R R R R U
  I I T T T T T T T T T M M M M M M   R     R     R     R     R     R     R     R     R O O O O O O M
  S S M M M M M M M M M E E E E E E   O     O     O     O     O     O     O     O     O A A A A A A P
O S S E E E E E E E E E T T T T T T   A     A     A     A     A     A     A     A     A D D D D D D O
B 1 1 T T T T T T T T T 1 1 1 1 1 1   D     D     D     D     D     D     D     D     D 1 1 1 1 1 1 L
S 4 5 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5   1     2     3     4     5     6     7     8     9 0 1 2 3 4 5 L

1 . . 5 5 5 5 5 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
2 . . 3 3 3 3 3 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
3 . . 3 3 3 3 3 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
4 . . 3 3 3 3 3 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
5 . . 3 3 3 3 3 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
6 . . 3 3 3 3 3 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
7 . . 3 3 3 3 3 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
8 . . 4 4 4 4 4 . . . . . . . . . . 42401 42603 43104 11101 42101 43101     .     .   . . . . . . . 6
9 . . 5 5 5 5 5 . . . . . . . . . . 42401 42603 43104 11101 42101 42302 42303 43101   . . . . . . . 8
```

Figure 4-6. MDEM sample "detailed" diagnostic report - point sources.

```
DATE: 23MAR88      TIME:  7:36:47
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)
                                                                          MODEL DATA EXTRACTION MODULE (MDEM)
DIAGNOSTIC REPORT                          1985 NAPAP INVENTORY-AREA SOURCES TEST                  SUMMARY  LISTING
----------------------------------------------------- CONTROL FILE LISTING ----------------------------------------

RUN IDENTIFICATION RECORD:

     SOURCE: AS  DETAIL: T  MINOR FLAG:    RUN ID: 1985 NAPAP INVENTORY-AREA SOURCES TEST 85 FREDS USA
POLLUTANT IDENTIFICATION RECORDS:  7
                                                       SAROAD    POLLUTANT
                                                      --------------------
                                                       42401      ASO2
                                                       11101      ATSP
                                                       42101      ACO
                                                       42604      ANH3
                                                       42603      ANOX
                                                       43104      AVOC
                                                       43101      ATHC
------------------------------------------------------ EMISSIONS FILE SUMMARY -------------------------------------
                                      TOTAL ZERO EMISSION AREA SOURCE RECORDS DELETED
                                      -----------------------------------------------------
                                       95114
                                      ADDITIONAL ZERO EMISSION AREA SOURCE THC RECORDS DELETED
                                      -----------------------------------------------------
                                        8415
                                      ADDITIONAL ZERO EMISSION AREA SOURCE TSP RECORDS DELETED
                                      -----------------------------------------------------
                                       10793
                                      TOTAL AREA SOURCE RECORDS READ INTO EMISSIONS FILE
                                      -----------------------------------------------------
                                      206568

                                       ANNUAL TOTALS FOR MDEM EMISSIONS FILE           7:27 WEDNESDAY, MARCH 23, 1988

                                             VARIABLE          SUM

                                             ASO2            1954998
                                             ATSP           34033278
                                             ACO            55471087
                                             ANH3             213940
                                             ANOX           11054492
                                             AVOC           12721512
                                             ATHC           17195322
```

Figure 4-7. MDEM sample "totals" diagnostic report - area sources.

TEMPORAL ALLOCATION MODULE

The Temporal Allocation Module (TAM) accepts emissions files or subfiles output from one of the FREDS allocation modules as input. This section presents the files accessed by the TAM:

- TAM Control Options File
- MTPREP Control Options File
- Time Zone File
- Area Source Temporal Allocation Factor File
- Point Source Temporal Allocation Factor File
- Temporally Allocated Emissions Files
- TAM Diagnostic Report

TAM Control Options File

The TAM Control Options File is an EBCDIC file containing one record type for point sources and three record types for area sources. The Run Identification record contains the following information for both source types: source type, level of detail for the diagnostic report, and SAS member name of the input emissions file. The number of temporal scenarios desired is required for point source runs. For area source runs, the number corresponding to a specific temporal scenario and a daylight savings flag is also required on the Run Identification record. The Pollutant Variable List record provides the variable name of each pollutant and is also required for area source runs. The third record, the Resolution record, defines the level of resolution of the input area source emissions. This allows the user flexibility of processing spatially allocated emissions (i.e., by column and row) or county level emissions (defined by SCC, state, county) by specifying "gridded" or "nongridded" in the control file.

A separate COF is input for MTPREP execution (MTPREP.FORT and MTPREP.SAS). This file has one record type and controls the number of pollutants which are multiplied by their temporal allocation factors and the level of resolution of the emissions data (gridded or nongridded). The same COF is used for execution of both MTPREP.FORT and MTPREP.SAS. The MTPREP job steps are executed for temporal allocation of area sources only.

FILE NAME: TAM Control Options File

RECORD NAME: Run Identification Record - Point Sources

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=1)
3	4	2	A	SOURCE	Source Type of Emissions File (='PS')
6	6	1	A	DETAIL	Level of Detail for the Diagnostic Report (='D' or ='S')
8	15	8	A	SASMEM	SAS Member Name of Input and Output Emissions Files
17	18	2	I	TAFDAY	Number of Temporal Scenarios to be Allocated
20	71	52	A	RUN_ID	Run Identification Header

FILE NAME: TAM Control Options File RECORD NAME: Run Identification Record - Area Sources

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (-1)
3	4	2	A	SOURCE	Source Type of Emissions File (-'AS')
6	6	1	A	DETAIL	Level of Detail for the Diagnostic Report (-'D' or -'S')
8	15	8	A	SASMEM	SAS Member Name of Input and Output Emissions Files
17	18	2	I	TAFDAY[a]	Code Number of Temporal Scenario to be Allocated
20	20	1	I	DAYLITE[b]	Daylight Savings Indicator for GMT offset
22	71	50	A	RUN_ID	Run Identification Header

---

[a] A listing of temporal scenario codes is given in Appendix H.

[b] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

FILE NAME: TAM Control Options File RECORD NAME: Pollutant Variable List Record - Area Sources

Record Position First	 Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=2)
3	72	70	A	LIST	List of Pollutant Variable Names[a]

FILE NAME: TAM Control Options File RECORD NAME: Resolution Record - Area Sources

Record Position First	 Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=3)
3	12	10	A	EMRES	Level of Resolution of input emissions data (='gridded' or ='nongridded')[b]

FILE NAME: MTPREP Control Options File[c] (Area Sources only) RECORD NAME: Area Source Record

Record Position First	 Last	Column Width	Format	Variable Name	Description
1	3	3	I	NUMPOLL	Number of Pollutants (maximum=100)
5	14	10	A	EMRES	Level of resolution of emissions data (='gridded' or ='nongridded')

---

[a] For the 1985 NAPAP area source inventory, the pollutant variable list is as follows: NO_x, VOC, THC, SESA1-SESA34 for the THC/NO_x split file and SO_2, SO_4, TSP, CO, NH_3, SESA35-SESA49 for the TSP/SO_2 split file.

[b] Gridded refers to spatially allocated emissions (resolved by column and row). Nongridded refers to county level emissions (by SCC, State, County).

[c] This control file is applicable to MTPREP.FORT AND MTPREP.SAS.

Time Zone File

FILE NAME: Time Zone File

RECORD NAME: Time Zone Record

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	2	2	I	STATE	AEROS State Code
3	6	4	I	COUNTY	AEROS County Code
7	7	1	I	ZONE	Time Zone Flag[a]
8	8	1	I	DAYLITE	Daylight Savings Indicator[b] for GMT offset and temporal processing

---

[a] For Time Zone Flag:

1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

[b] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

Temporal Allocation Factor Files

FILE NAME: Area Source Temporal Allocation Factor File **RECORD NAME:** Area Source Temporal Allocation Factor Record

Page 1 of 1

Record Position First	Record Position Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	NUM.DAY	Temporal Scenario Code[a]
		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		8	I	SCC	SCC (Source Classification Code)
		8	F	SEA	Seasonal Temporal Allocation Factor
		8	F	DAY	Daily Temporal Allocation Factor
		8	F	HOUR1-24	Hourly Temporal Allocation Factor[b]

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name.

[b] Hourly factors are repeated for each hour per day.

FILE_NAME: Point Source Temporal Allocation Factor File

RECORD NAME: Point Source Temporal Allocation Factor Record

Page 1 of 1

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	NUM.DAY	Temporal Scenario Code[b]
		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		8	I	SCC	SCC (Source Classification Code)
		8	A	PLANT_ID	Plant Identifier
		8	A	POINT_ID	Point Identifier
		8	F	SEA1-12	Seasonal Temporal Allocation Factor[b]
		8	F	DAY1-12	Daily Temporal Allocation Factor[c]
		8	F	HOUR1-288	Hourly Temporal Allocation Factor[d]

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name.

[b] Seasonal factors are repeated for 3 day types for each of four seasons. A listing of temporal scenario codes is provided in Appendix H.

[c] Daily factors are repeated for 3 day types for each of four seasons.

[d] Hourly factors are repeated for 12 daily scenarios.

Temporally Allocated Emissions Files

Temporally Allocated Point Source Emissions File--

The TAM point source output contains source location (latitude, longitude), identification (Plant_ID, Point_ID), and emissions data for up to 15 annual pollutants and pollutant subspecies. Temporal data added to each record include seasonal, daily and 24 hourly hourly percentages (relative to GMT), and flags used for hourly percentage offsets (i.e., the Time Zone and Daylight Savings flags). The file is output in SAS format, and therefore, variables are referenced by name. The order of the variables presented in the following pages are not necessarily the order of the SAS output file. Output variable names and descriptions are given for module execution as depicted in System Charts.

Temporally Allocated Area Source Emissions File--

The TAM area source output contains area source location data (column and row or SCC, state, and county) and temporally resolved emissions for up to 15 pollutant categories and pollutant subspecies. The file is output in SAS format. The reader should refer to notes on SAS files with the temporally allocated point source file description above. Variable names and descriptions are given for module flow as illustrated in the area source systems chart.

FILE NAME: Temporally Allocated Point Source Emissions File RECORD NAME: Point Source Record

Page 1 of 3

Record Position		SAS Length (Bytes)	Type	Variable Name	Description
First	Last				
N/A[a]		8	I	SCC	SCC Code
		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		4	A	PLANT_ID	Plant Identification Code
		2	A	POINT_ID	Point Identification Code
		8	I	AQCR	Air Quality Control Region
		8	I	SIC	SIC Code
		8	F	LAT	Fractional Latitude (degrees)
		8	F	LON	Fractional Longitude (degrees)
		8	I	COL	Grid Column
		8	I	ROW	Grid Row
		8	I	SAF	Spatial Allocation Fraction (-1 for point sources)
		8	I	ZONE	Time Zone Flag[b]
		8	I	DAYLITE	Daylight Savings Flag[c]
		8	F	FLOW	Exhaust Gas Flow Rate (ft^3/min)
		8	F	PLUME_HT	Plume Height (ft)
		8	F	STACK_DI	Stack Diameter (ft)

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name.

[b] For Time Zone Flag:
1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

[c] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

FILE NAME: Temporally Allocated Point Source Emissions File **RECORD NAME:** Point Source Record

Page 2 of 3

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	STACK_HT	Stack Height (ft)
		8	F	STACK_TP	Stack Temperature (°F)
		8	F	VELOCITY	Stack Gas Velocity (ft/min)
		8	I	NUMPOLL	Number of Pollutants
		8	I	SAROAD1-15	Pollutant SAROAD Codes
		8	F	EMISS1-15	Pollutant Emissions (tons/yr)

NOTE: SAROAD and EMISS will be repeated NUMPOLL (up to 15) times, once for each pollutant.

		8	I	NUM_DAY	Number of Temporal Scenarios in Record
		8	F	SEA1-12	Seasonal Temporal Allocation Factor
		8	F	DAY1-12	Daily Temporal Allocation Factor
		8	F	HFGMT1	Temporal Allocation Factor for Hour 1
		8	F	HFGMT2	Temporal Allocation Factor for Hour 2
		8	F	HFGMT3	Temporal Allocation Factor for Hour 3
		8	F	HFGMT4	Temporal Allocation Factor for Hour 4
		8	F	HFGMT5	Temporal Allocation Factor for Hour 5
		8	F	HFGMT6	Temporal Allocation Factor for Hour 6
		8	F	HFGMT7	Temporal Allocation Factor for Hour 7
		8	F	HFGMT8	Temporal Allocation Factor for Hour 8
		8	F	HFGMT9	Temporal Allocation Factor for Hour 9
		8	F	HFGMT10	Temporal Allocation Factor for Hour 10

FILE NAME: Temporally Allocated Point Source Emissions File RECORD NAME: Point Source Record

Page 3 of 3

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	HFGMT11	Temporal Allocation Factor for Hour 11
		8	F	HFGMT12	Temporal Allocation Factor for Hour 12
		8	F	HFGMT13	Temporal Allocation Factor for Hour 13
		8	F	HFGMT14	Temporal Allocation Factor for Hour 14
		8	F	HFGMT15	Temporal Allocation Factor for Hour 15
		8	F	HFGMT16	Temporal Allocation Factor for Hour 16
		8	F	HFGMT17	Temporal Allocation Factor for Hour 17
		8	F	HFGMT18	Temporal Allocation Factor for Hour 18
		8	F	HFGMT19	Temporal Allocation Factor for Hour 19
		8	F	HFGMT20	Temporal Allocation Factor for Hour 20
		8	F	HFGMT21	Temporal Allocation Factor for Hour 21
		8	F	HFGMT22	Temporal Allocation Factor for Hour 22
		8	F	HFGMT23	Temporal Allocation Factor for Hour 23
		8	F	HFGMT24	Temporal Allocation Factor for Hour 24

NOTE: HFGMT1 to HFGMT24 will be repeated 12 times, once for each temporal scenario. The variable HFGMT may therefore range from HFGMT1 to HFGMT288, where HFGMT is in GMT.

		8	F	CONEFF1-15	Control Efficiency of Point Pollutant
		8	I	ESTMET1-15	Estimation Method Used for Point Pollutant[d]

NOTE: CONEFF and ESTMET will be repeated NUMPOLL (up to 15) times, once for each pollutant.

---

[d] A listing of point source estimation methods is given in Appendix H.

FILE NAME: Temporally Allocated Area Source Emissions File-THC/NO_x Split

RECORD NAME: Area Source Record

Page 1 of 3

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	COL	Grid Column
		8	I	ROW	Grid Row
		8	I	GMT	Hour (Greenwich Mean Time)
		8	F	TOT1	NO_x Emissions (tons/hour)
		8	F	TOT2	VOC Emissions (tons/hour)
		8	F	TOT3	THC Emissions (tons/hour)
		8	F	TOT4	Methane Emissions (moles/hour)
		8	F	TOT5	Ethane Emissions (moles/hour)
		8	F	TOT6	Propane Emissions (moles/hour)
		8	F	TOT7	Alkane (reactivity 1) Emissions (moles/hour)
		8	F	TOT8	Alkane (reactivity 2) Emissions (moles/hour)
		8	F	TOT9	Alkane (reactivity 3) Emissions (moles/hour)
		8	F	TOT10	Alkane (reactivity 4) Emissions (moles/hour)
		8	F	TOT11	Alkane/Aromatic Mix Emissions (moles/hour)
		8	F	TOT12	Ethene Emissions (moles/hour)
		8	F	TOT13	Propene Emissions (moles/hour)
		8	F	TOT14	Primary Alkene Emissions (moles/hour)
		8	F	TOT15	Internal Alkene Emissions (moles/hour)

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name.

FILE NAME: Temporally Allocated Area Source Emissions File THC/NO_x Split

RECORD NAME: Area Source Record

Page 2 of 3

Record Position First	Record Position Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	TOT16	Primary/Internal Mix Alkene Emissions (moles/hour)
		8	F	TOT17	Benzene/Halobenzene Emissions (moles/hour)
		8	F	TOT18	Aromatic (reactivity 1) Emissions (moles/hour)
		8	F	TOT19	Aromatic (reactivity 2) Emissions (moles/hour)
		8	F	TOT20	Phenol/Cresols Emissions (moles/hour)
		8	F	TOT21	Styrenes Emissions (moles/hour)
		8	F	TOT22	Formaldehyde Emissions (moles/hour)
		8	F	TOT23	Higher Aldehydes Emissions (moles/hour)
		8	F	TOT24	Acetone Emissions (moles/hour)
		8	F	TOT25	Higher Ketones Emissions (moles/hour)
		8	F	TOT26	Organic Acids Emissions (moles/hour)
		8	F	TOT27	Acetylene Emissions (moles/hour)
		8	F	TOT28	Haloalkenes Emissions (moles/hour)
		8	F	TOT29	Unreactive Hydrocarbon Emissions (moles/hour)
		8	F	TOT30	Other Hydrocarbon (reactivity 1) Emissions (moles/hour)
		8	F	TOT31	Other Hydrocarbon (reactivity 2) Emissions (moles/hour)
		8	F	TOT32	Other Hydrocarbon (reactivity 3) Emissions (moles/hour)

FILE NAME: Temporally Allocated Area Source Emissions File THC/NO_x Split

RECORD NAME: Area Source Record

Page 3 of 3

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	TOT33	Other Hydrocarbon (reactivity 4) Emissions (moles/hour)
		8	F	TOT34	Unidentified Hydrocarbon Emissions (moles/hour)
		8	F	TOT35	Unassigned Hydrocarbon Emissions (moles/hour)
		8	F	TOT36	NO Emissions (tons/hour)
		8	F	TOT37	NO_2 Emissions (tons/hour)

FILE NAME: Temporally Allocated Area Source Emissions File-TSP/SO_2 Split

RECORD NAME: Area Source Record

Page 1 of 2

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	COL	Grid Column
		8	I	ROW	Grid Row
		8	I	GMT	Hour (Greenwich Mean Time)
		8	F	TOT1	SO_2 Emissions (tons/hour)
		8	F	TOT2	SO_4 Emissions (tons/hour)
		8	F	TOT3	TSP Emissions (tons/hour)
		8	F	TOT4	CO Emissions (tons/hour)
		8	F	TOT5	NH_3 Emissions (tons/hour)
		8	F	TOT6	Calcium Emissions, 0-2.5 um (tons/hour)
		8	F	TOT7	Calcium Emissions, 2.5-10 um (tons/hour)
		8	F	TOT8	Calcium Emissions, Total Particulate (tons/hour)
		8	F	TOT9	Magnesium Emissions, 0-2.5 um (tons/hour)
		8	F	TOT10	Magnesium Emissions, 2.5-10 um (tons/hour)
		8	F	TOT11	Magnesium Emissions, Total Particulate (tons/hour)
		8	F	TOT12	Potassium Emissions, 0-2.5 um (tons/hour)
		8	F	TOT13	Potassium Emissions, 2.5-10 um (tons/hour)
		8	F	TOT14	Potassium Emissions, Total Particulate (tons/hour)
		8	F	TOT15	Sodium Emissions, 0-2.5 um (tons/hour)

FILE NAME: Temporally Allocated Area Source Emissions File-TSP/SO_2 Split

RECORD NAME: Area Source Record

Page 2 of 2

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	TOT16	Sodium Emissions, 2.5-10 um (tons/hour)
		8	F	TOT17	Sodium Emissions, Total Particulate (tons/hour)
		8	F	TOT18	Total Particulates, 0-2.5 um (tons/hour)
		8	F	TOT19	Total Particulates, 2.5-6 um (tons/hour)
		8	F	TOT20	Total Particulates, 6-10 um (tons/hour)

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name.

TAM Diagnostic Report

The diagnostic report documents the actions of TAM. For both point and area sources, run date and time, title, and control options are always printed along with the distribution of how many records were assigned temporal patterns by varying methods. A count of the emissions records processed is supplied in the SAS job log. If a detailed report is requested, a subset of the temporal allocation factors merged into point and area source emission records are also printed along with the emissions. MTPREP.FORT does not generate a diagnostic report. Processing of this routine may be followed by checking the JES2 and SAS job logs. MTPREP.SAS generates a brief report, echoing the control options. Sample diagnostic reports for point and area source TAM runs using a subset of the NAPAP data base are given in Figures 4-8 and 4-9, respectively. Note: The MTPREP.SAS report is not included with the TAM area source report.

```
DATE: 23JAN89     TIME: 18:37:45
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)                                    TEMPORAL ALLOCATION MODULE
DIAGNCSTIC REPORT                    TAM 1985 NAPAP INV.-POINT SOURCES 85 FREDS USA V30            DETAILED LISTING
-------------------------------------------------- CONTROL FILE LISTING ---------------------------------------------
RUN IDENTIFICATION RECORD:
     SOURCE: PS  DETAIL: D  RUN ID: TAM 1985 NAPAP INV.-POINT SOURCES 85 FREDS USA V30
                                              NUMBER OF DAYS IN TEMPORAL ALLOCATION FILE: 12

     NUMBER OF RECORDS WITH TEMPORAL PATTERNS BASED ON : POINT TAF MATCH    58
                                                         COUNTY TAF MATCH   0
                                                         STATE  TAF MATCH   1066
                                                         SCC    TAF MATCH   2782
                                                         OPERATING DATA     56563
                                                         UNIFORM PATTERN    3066

                                              EMPLOYED TEMPORAL FACTORS - FIRST 10 OBSERVATIONS      17:09 MONDAY, JANUARY 23, 1989

                    P    P
                    L    OD  N
                 C  A    IA  U
           S     O  N    NY  M                                                 S    S    S
           T     U  T    ZTL _    S    S    S    S    S    S    S    S    S    E    E    E    D     D     D     D     D
       S   A     N  _    O_I D    E    E    E    E    E    E    E    E    E    A    A    A    A     A     A     A     A
       C   T     T  I    NIT A    A    A    A    A    A    A    A    A    A    1    1    1    Y     Y     Y     Y     Y
       C   E     Y  D    EDE Y    1    2    3    4    5    6    7    8    9    0    1    2    1     2     3     4     5

10100101  07  0265  0195 501 12 .580 .580 .580 .300 .300 .300 .090 .090 .090 .030 .030 .030 .0115 .0099 .0094 .0117 .0094
10100101  39  4700  0054 501 12 .250 .250 .250 .240 .240 .240 .270 .270 .270 .240 .240 .240 .0115 .0099 .0094 .0117 .0094
10100101  39  5220  0014 501 12 .250 .250 .250 .240 .240 .240 .270 .270 .270 .240 .240 .240 .0115 .0099 .0094 .0117 .0094
10100101  39  8320  0002 501 12 .250 .250 .250 .240 .240 .240 .270 .270 .270 .240 .240 .240 .0115 .0099 .0094 .0117 .0094
10100101  39  8320  0002 501 12 .250 .250 .250 .240 .240 .240 .270 .270 .270 .240 .240 .240 .0115 .0099 .0094 .0117 .0094
10100101  39  8320  0002 501 12 .250 .250 .250 .240 .240 .240 .270 .270 .270 .240 .240 .240 .0115 .0099 .0094 .0117 .0094
10100101  39  8320  0002 501 12 .250 .250 .250 .240 .240 .240 .270 .270 .270 .240 .240 .240 .0115 .0099 .0094 .0117 .0094
10100101  45  0810  0005 611 12 .250 .250 .250 .250 .250 .250 .250 .250 .250 .250 .250 .250 .0115 .0099 .0094 .0117 .0094
10100101  49  1100  0010 811 12 .250 .250 .250 .250 .250 .250 .250 .250 .250 .250 .250 .250 .0115 .0099 .0094 .0117 .0094

                    P    P
                    L    O                                                                                         H    H
                 C  A    I                                           H    H    H    H    H    H    H    H    H    F    F
           S     O  N    N                         D     D     D     F    F    F    F    F    F    F    F    F    G    G
           T     U  T    T D     D     D     D     A     A     A     G    G    G    G    G    G    G    G    G    M    M
       S   A     N  _    _ A     A     A     A     Y     Y     Y     M    M    M    M    M    M    M    M    M    T    T
       C   T     T  I    I Y     Y     Y     Y     1     1     1     T    T    T    T    T    T    T    T    T    1    1
       C   E     Y  D    D 6     7     8     9     0     1     2     1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .053 .051 .045 .035 .027 .024 .023 .023 .022 .023 .026
10100101  39  4700  0054 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .045 .044 .043 .042 .040 .039 .037 .037 .036 .037 .038
10100101  39  5220  0014 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .045 .044 .043 .042 .040 .039 .037 .037 .036 .037 .038
10100101  39  8320  0002 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .045 .044 .043 .042 .040 .039 .037 .037 .036 .037 .038
10100101  39  8320  0002 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .045 .044 .043 .042 .040 .039 .037 .037 .036 .037 .038
10100101  39  8320  0002 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .045 .044 .043 .042 .040 .039 .037 .037 .036 .037 .038
10100101  39  8320  0002 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .045 .044 .043 .042 .040 .039 .037 .037 .036 .037 .038
10100101  45  0810  0005 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .048 .047 .046 .044 .041 .038 .035 .034 .033 .033 .033
10100101  49  1100  0010 .0092 .0116 .0100 .0090 .0117 .0094 .0092 .046 .047 .048 .047 .046 .044 .041 .038 .035 .034 .033
```

Figure 4-8. TAM sample "detailed" diagnostic report - point sources.

```
                    P  P
                    L  O H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
               C    A  I F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
          S    O    N  N G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
          T    U    T  T M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
       S  A    N    _  _ T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       C  T    T    I  I 1    1    1    1    1    1    1    2    2    2    2    2    2    2    2    2    2    3    3
       C  E    Y    D  D 2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101 07 0265 0195 .035 .045 .050 .052 .052 .052 .051 .051 .050 .049 .052 .056 .055 .047 .045 .043 .040 .036 .036 .033
10100101 39 4700 0054 .040 .042 .043 .044 .044 .044 .044 .044 .043 .043 .043 .044 .045 .047 .045 .043 .040 .036 .036 .033
10100101 39 5220 0014 .040 .042 .043 .044 .044 .044 .044 .044 .043 .043 .043 .044 .045 .047 .045 .043 .040 .036 .036 .033
10100101 39 8320 0002 .040 .042 .043 .044 .044 .044 .044 .044 .043 .043 .043 .044 .045 .047 .045 .043 .040 .036 .036 .033
10100101 39 8320 0002 .040 .042 .043 .044 .044 .044 .044 .044 .043 .043 .043 .044 .045 .047 .045 .043 .040 .036 .036 .033
10100101 39 8320 0002 .040 .042 .043 .044 .044 .044 .044 .044 .043 .043 .043 .044 .045 .047 .045 .043 .040 .036 .036 .033
10100101 39 8320 0002 .040 .042 .043 .044 .044 .044 .044 .044 .043 .043 .043 .044 .045 .047 .045 .043 .040 .036 .036 .033
10100101 45 0810 0005 .035 .038 .042 .045 .046 .046 .046 .046 .045 .045 .045 .046 .047 .049 .047 .045 .043 .040 .036 .036
10100101 49 1100 0010 .033 .033 .035 .038 .042 .045 .046 .046 .046 .046 .045 .045 .045 .048 .051 .049 .047 .045 .043 .040
                                 EMPLOYED TEMPORAL FACTORS - FIRST 10 OBSERVATIONS      17:09 MONDAY, JANUARY 23, 1989

                    P  P
                    L  O H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
               C    A  I F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
          S    O    N  N G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
          T    U    T  T M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
       S  A    N    _  _ T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       C  T    T    I  I 3    3    3    3    3    3    3    3    4    4    4    4    4    4    4    4    4    4    5    5
       C  E    Y    D  D 2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101 07 0265 0195 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .049 .050 .048 .046
10100101 39 4700 0054 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .049 .050 .048 .046
10100101 39 5220 0014 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .049 .050 .048 .046
10100101 39 8320 0002 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .049 .050 .048 .046
10100101 39 8320 0002 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .049 .050 .048 .046
10100101 39 8320 0002 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .049 .050 .048 .046
10100101 39 8320 0002 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .049 .050 .048 .046
10100101 45 0810 0005 .033 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .051 .050 .048
10100101 49 1100 0010 .036 .036 .033 .033 .033 .033 .033 .036 .039 .043 .047 .048 .048 .048 .045 .044 .044 .048 .051 .051

                    P  P
                    L  O H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
               C    A  I F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
          S    O    N  N G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
          T    U    T  T M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
       S  A    N    _  _ T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       C  T    T    I  I 5    5    5    5    5    5    5    5    6    6    6    6    6    6    6    6    6    6    7    7
       C  E    Y    D  D 2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101 07 0265 0195 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048 .051
10100101 39 4700 0054 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048 .051
10100101 39 5220 0014 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048 .051
10100101 39 8320 0002 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048 .051
10100101 39 8320 0002 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048 .051
10100101 39 8320 0002 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048 .051
10100101 39 8320 0002 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048 .051
10100101 45 0810 0005 .046 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044 .045 .048
10100101 49 1100 0010 .050 .048 .046 .043 .039 .036 .034 .033 .032 .032 .033 .035 .037 .040 .042 .044 .045 .046 .045 .044
```

Figure 4-8 (continued)

```
                    P     P
                    L     O H   H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                 C  A     I F   F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
           S     O  N     N G   G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           T     U  T     T M   M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
       S   A     N  _     _ T   T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       C   T     T  I     I 7   7    7    7    7    7    7    7    8    8    8    8    8    8    8    8    8    8    9    9
       C   E     Y  D     D 2   3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .051 .053 .045 .032 .023 .020 .019 .018 .018 .019 .021 .028 .044 .055 .059 .059 .058 .056 .056 .053
10100101  39  4700  0054 .051 .045 .044 .043 .040 .038 .037 .035 .036 .037 .037 .039 .042 .044 .044 .044 .044 .044 .044 .044
10100101  39  5220  0014 .051 .045 .044 .043 .040 .038 .037 .035 .036 .037 .037 .039 .042 .044 .044 .044 .044 .044 .044 .044
10100101  39  8320  0002 .051 .045 .044 .043 .040 .038 .037 .035 .036 .037 .037 .039 .042 .044 .044 .044 .044 .044 .044 .044
10100101  39  8320  0002 .051 .045 .044 .043 .040 .038 .037 .035 .036 .037 .037 .039 .042 .044 .044 .044 .044 .044 .044 .044
10100101  39  8320  0002 .051 .045 .044 .043 .040 .038 .037 .035 .036 .037 .037 .039 .042 .044 .044 .044 .044 .044 .044 .044
10100101  39  8320  0002 .051 .045 .044 .043 .040 .038 .037 .035 .036 .037 .037 .039 .042 .044 .044 .044 .044 .044 .044 .044
10100101  45  0810  0005 .051 .049 .048 .045 .040 .034 .031 .030 .029 .029 .030 .032 .036 .043 .047 .049 .049 .049 .048 .048
10100101  49  1100  0010 .045 .047 .047 .049 .048 .045 .040 .034 .031 .030 .029 .029 .030 .032 .036 .043 .047 .049 .049 .049
                                        EMPLOYED TEMPORAL FACTORS - FIRST 10 OBSERVATIONS       17:09 MONDAY, JANUARY 23, 1989
                    P     P                                        H    H    H    H    H    H    H    H    H    H    H    H
                    L     O H   H    H    H    H    H    H    H    F    F    F    F    F    F    F    F    F    F    F    F
                 C  A     I F   F    F    F    F    F    F    F    G    G    G    G    G    G    G    G    G    G    G    G
           S     O  N     N G   G    G    G    G    G    G    G    M    M    M    M    M    M    M    M    M    M    M    M
           T     U  T     T M   M    M    M    M    M    M    M    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N  _     _ T   T    T    T    T    T    T    T    1    1    1    1    1    1    1    1    1    1    1    1
       C   T     T  I     I 9   9    9    9    9    9    9    9    0    0    0    0    0    0    0    0    0    0    1    1
       C   E     Y  D     D 2   3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .051 .052 .051 .053 .056 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047 .048
10100101  39  4700  0054 .044 .044 .044 .044 .045 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047 .048
10100101  39  5220  0014 .044 .044 .044 .044 .045 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047 .048
10100101  39  8320  0002 .044 .044 .044 .044 .045 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047 .048
10100101  39  8320  0002 .044 .044 .044 .044 .045 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047 .048
10100101  39  8320  0002 .044 .044 .044 .044 .045 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047 .048
10100101  39  8320  0002 .044 .044 .044 .044 .045 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047 .048
10100101  45  0810  0005 .047 .046 .047 .047 .047 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038 .043 .047
10100101  49  1100  0010 .048 .048 .047 .046 .047 .046 .046 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032 .034 .038

                    P     P H   H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                    L     O F   F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
                 C  A     I G   G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           S     O  N     N M   M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
           T     U  T     T T   T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N  _     _ 1   1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
       C   T     T  I     I 1   1    1    1    1    1    1    1    2    2    2    2    2    2    2    2    2    2    3    3
       C   E     Y  D     D 2   3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036 .037
10100101  39  4700  0054 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036 .037
10100101  39  5220  0014 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036 .037
10100101  39  8320  0002 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036 .037
10100101  39  8320  0002 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036 .037
10100101  39  8320  0002 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036 .037
10100101  39  8320  0002 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036 .037
10100101  45  0810  0005 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037 .036 .036 .036 .036
10100101  49  1100  0010 .043 .047 .048 .049 .047 .047 .045 .045 .046 .043 .044 .047 .050 .048 .044 .039 .039 .037 .036 .036
```

Figure 4-8 (continued)

```
                    P     P H   H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                    L     O F   F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
                 C  A     I G   G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           S     O  N     N M   M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
           T     U  T     T T   T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N  _     _ 1   1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
       C   T     T  I     I 3   3    3    3    3    3    3    3    4    4    4    4    4    4    4    4    4    4    5    5
       C   E     Y  D     D 2   3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .050 .043 .032 .024 .021 .020 .019
10100101  39  4700  0054 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .045 .043 .040 .036 .036 .035 .034
10100101  39  5220  0014 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .045 .043 .040 .036 .036 .035 .034
10100101  39  8320  0002 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .045 .043 .040 .036 .036 .035 .034
10100101  39  8320  0002 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .045 .043 .040 .036 .036 .035 .034
10100101  39  8320  0002 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .045 .043 .040 .036 .036 .035 .034
10100101  39  8320  0002 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .045 .043 .040 .036 .036 .035 .034
10100101  45  0810  0005 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044 .047 .047 .043 .037 .031 .030 .029
10100101  49  1100  0010 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .049 .047 .047 .047 .043 .037 .031
                                       EMPLOYED TEMPORAL FACTORS - FIRST 10 OBSERVATIONS      17:09 MONDAY, JANUARY 23, 1989

                    P     P H   H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                    L     O F   F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
                 C  A     I G   G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           S     O  N     N M   M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
           T     U  T     T T   T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N  _     _ 1   1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
       C   T     T  I     I 5   5    5    5    5    5    5    5    6    6    6    6    6    6    6    6    6    6    7    7
       C   E     Y  D     D 2   3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .019 .020 .023 .033 .044 .052 .057 .057 .057 .057 .057 .056 .056 .055 .051 .048 .050 .046 .044 .042
10100101  39  4700  0054 .034 .034 .036 .040 .042 .044 .046 .046 .046 .046 .046 .046 .046 .046 .045 .044 .045 .046 .044 .042
10100101  39  5220  0014 .034 .034 .036 .040 .042 .044 .046 .046 .046 .046 .046 .046 .046 .046 .045 .044 .045 .046 .044 .042
10100101  39  8320  0002 .034 .034 .036 .040 .042 .044 .046 .046 .046 .046 .046 .046 .046 .046 .045 .044 .045 .046 .044 .042
10100101  39  8320  0002 .034 .034 .036 .040 .042 .044 .046 .046 .046 .046 .046 .046 .046 .046 .045 .044 .045 .046 .044 .042
10100101  39  8320  0002 .034 .034 .036 .040 .042 .044 .046 .046 .046 .046 .046 .046 .046 .046 .045 .044 .045 .046 .044 .042
10100101  39  8320  0002 .034 .034 .036 .040 .042 .044 .046 .046 .046 .046 .046 .046 .046 .046 .045 .044 .045 .046 .044 .042
10100101  45  0810  0005 .028 .028 .028 .031 .036 .042 .047 .049 .051 .051 .050 .051 .050 .050 .050 .049 .047 .045 .046 .044
10100101  49  1100  0010 .030 .029 .028 .028 .028 .031 .036 .042 .047 .049 .051 .051 .050 .051 .050 .050 .050 .047 .046 .045

                    P     P H   H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                    L     O F   F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
                 C  A     I G   G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           S     O  N     N M   M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
           T     U  T     T T   T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N  _     _ 1   1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1    1
       C   T     T  I     I 7   7    7    7    7    7    7    7    8    8    8    8    8    8    8    8    8    8    9    9
       C   E     Y  D     D 2   3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047 .046
10100101  39  4700  0054 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047 .046
10100101  39  5220  0014 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047 .046
10100101  39  8320  0002 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047 .046
10100101  39  8320  0002 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047 .046
10100101  39  8320  0002 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047 .046
10100101  39  8320  0002 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047 .046
10100101  45  0810  0005 .042 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047 .047 .047
10100101  49  1100  0010 .046 .044 .042 .037 .038 .035 .033 .032 .031 .032 .033 .036 .041 .045 .048 .049 .049 .048 .047 .047
```

Figure 4-8 (continued)

```
                       P  P H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                       L  O F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
                 C     A  I G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           S     O     N  N M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
           T     U     T  T T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N     _  _ 1    1    1    1    1    1    1    1    2    2    2    2    2    2    2    2    2    2    2    2
       C   T     T     I  I 9    9    9    9    9    9    9    9    0    0    0    0    0    0    0    0    0    0    1    1
       C   E     Y     D  D 2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .045 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048 .047
10100101  39  4700  0054 .045 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048 .047
10100101  39  5220  0014 .045 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048 .047
10100101  39  8320  0002 .045 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048 .047
10100101  39  8320  0002 .045 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048 .047
10100101  39  8320  0002 .045 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048 .047
10100101  39  8320  0002 .045 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048 .047
10100101  45  0810  0005 .046 .046 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047 .048 .048
10100101  49  1100  0010 .047 .046 .046 .046 .048 .048 .045 .041 .039 .036 .034 .034 .033 .032 .032 .034 .038 .041 .045 .047
                                EMPLOYED TEMPORAL FACTORS - FIRST 10 OBSERVATIONS          17:09 MONDAY, JANUARY 23, 1989
                       P  P H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                       L  O F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
                 C     A  I G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           S     O     N  N M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
           T     U     T  T T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N     _  _ 2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2
       C   T     T     I  I 1    1    1    1    1    1    1    1    2    2    2    2    2    2    2    2    2    2    3    3
       C   E     Y     D  D 2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .047 .046 .046 .046 .046 .055 .048 .037 .028 .020 .018 .017 .017 .017 .020 .030 .044 .052 .055 .056
10100101  39  4700  0054 .047 .046 .046 .046 .046 .044 .043 .042 .041 .037 .038 .037 .037 .037 .038 .040 .042 .043 .044 .044
10100101  39  5220  0014 .047 .046 .046 .046 .046 .044 .043 .042 .041 .037 .038 .037 .037 .037 .038 .040 .042 .043 .044 .044
10100101  39  8320  0002 .047 .046 .046 .046 .046 .044 .043 .042 .041 .037 .038 .037 .037 .037 .038 .040 .042 .043 .044 .044
10100101  39  8320  0002 .047 .046 .046 .046 .046 .044 .043 .042 .041 .037 .038 .037 .037 .037 .038 .040 .042 .043 .044 .044
10100101  39  8320  0002 .047 .046 .046 .046 .046 .044 .043 .042 .041 .037 .038 .037 .037 .037 .038 .040 .042 .043 .044 .044
10100101  39  8320  0002 .047 .046 .046 .046 .046 .044 .043 .042 .041 .037 .038 .037 .037 .037 .038 .040 .042 .043 .044 .044
10100101  45  0810  0005 .047 .047 .046 .046 .046 .049 .048 .045 .040 .035 .030 .031 .030 .030 .031 .033 .037 .043 .046 .048
10100101  49  1100  0010 .048 .048 .047 .047 .046 .047 .048 .049 .048 .045 .040 .035 .030 .031 .030 .030 .031 .033 .037 .043
                       P  P H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                       L  O F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
                 C     A  I G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
           S     O     N  N M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
           T     U     T  T T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S   A     N     _  _ 2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2
       C   T     T     I  I 3    3    3    3    3    3    3    3    4    4    4    4    4    4    4    4    4    4    5    5
       C   E     Y     D  D 2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101  07  0265  0195 .056 .055 .055 .053 .051 .052 .053 .057 .056 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032
10100101  39  4700  0054 .044 .044 .044 .044 .043 .043 .043 .044 .044 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032
10100101  39  5220  0014 .044 .044 .044 .044 .043 .043 .043 .044 .044 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032
10100101  39  8320  0002 .044 .044 .044 .044 .043 .043 .043 .044 .044 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032
10100101  39  8320  0002 .044 .044 .044 .044 .043 .043 .043 .044 .044 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032
10100101  39  8320  0002 .044 .044 .044 .044 .043 .043 .043 .044 .044 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032
10100101  39  8320  0002 .044 .044 .044 .044 .043 .043 .043 .044 .044 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032 .032
10100101  45  0810  0005 .048 .048 .047 .047 .047 .046 .046 .047 .048 .046 .047 .048 .046 .043 .038 .036 .034 .032 .031 .032
10100101  49  1100  0010 .046 .048 .048 .048 .047 .047 .047 .046 .046 .046 .046 .046 .047 .048 .046 .043 .038 .036 .034 .032
```

Figure 4-8 (continued)

```
                    P  P H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                    L  O F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
               C    A  I G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
          S    O    N  N M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
          T    U    T  T T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S  A    N    _  _ 2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2
       C  T    T    I  I 5    5    5    5    5    5    5    5    6    6    6    6    6    6    6    6    6    6    7    7
       C  E    Y    D  D 2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8    9    0    1

10100101 07 0265 0195 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037
10100101 39 4700 0054 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037
10100101 39 5220 0014 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037
10100101 39 8320 0002 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037
10100101 39 8320 0002 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037
10100101 39 8320 0002 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037
10100101 39 8320 0002 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .046 .047 .050 .048 .044 .039 .039 .037
10100101 45 0810 0005 .032 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .046 .046 .044 .047 .050 .048 .044 .039 .039
10100101 49 1100 0010 .031 .032 .032 .034 .038 .043 .047 .048 .049 .047 .047 .045 .045 .042 .043 .044 .047 .050 .048 .044
                                   EMPLOYED TEMPORAL FACTORS - FIRST 10 OBSERVATIONS         17:09 MONDAY, JANUARY 23, 1989

                    P  P    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H    H
                    L  O    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F    F
               C    A  I    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G    G
          S    O    N  N    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M    M
          T    U    T  T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T    T
       S  A    N    _  _    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2    2
       C  T    T    I  I    7    7    7    7    7    7    7    7    8    8    8    8    8    8    8    8    8
       C  E    Y    D  D    2    3    4    5    6    7    8    9    0    1    2    3    4    5    6    7    8

10100101 07 0265 0195 03 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044
10100101 39 4700 0054 01 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044
10100101 39 5220 0014 01 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044
10100101 39 8320 0002 01 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044
10100101 39 8320 0002 02 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044
10100101 39 8320 0002 03 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044
10100101 39 8320 0002 04 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043 .044
10100101 45 0810 0005 11 .037 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041 .042 .043
10100101 49 1100 0010 10 .039 .039 .037 .036 .036 .036 .036 .037 .040 .042 .044 .044 .045 .045 .044 .042 .041
```

Figure 4-8 (continued)

```
DATE: 08JAN89      TIME:  0:05:00
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)
DIAGNOSTIC REPORT                                                       TEMPORAL ALLOCATION MODULE (TAM)
                                           1985 NAPAP INVENTORY-FREDS 85 TAM RUN       DETAILED LISTING
-------------------------------------------------- CONTROL FILE LISTING ------------------------------
RUN IDENTIFICATION RECORD:
     SOURCE: AS  DETAIL: D  RUN ID: 1985 NAPAP INVENTORY-FREDS 85 TAM RUN
                                          TEMPORAL SCENARIO PROCESSED: 4
POLLUTANT IDENTIFICATION RECORD:
     VARIABLE LIST: NOX VOC THC SESA1-SESA34
EMISSIONS RESOLUTION RECORD:
     EMISSIONS RESOLUTION: GRIDDED

     NUMBER OF RECORDS WITH TEMPORAL PATTERNS BASED ON : STA TAF MATCH   0
                                                         SCC TAF MATCH   361999
                                                         UNIFORM PATTERN 0


           TAM ADDITIONS TO EMISSION RECORDS  (30 OBS)    23:36 SATURDAY, JANUARY 7, 1989

   SCC     STATE     GMT1        GMT2        GMT3        GMT4        GMT5         GMT6         GMT7         GMT8

 00000027  01   .000133505 .000103837 .000094937 .000083070 .0000652691 .0000445016 .0000326345 .0000296678
 00000027  03   .000207674 .000163173 .000133505 .000103837 .0000949368 .0000830697 .0000652691 .0000445016
 00000027  04   .000133505 .000103837 .000094937 .000083070 .0000652691 .0000445016 .0000326345 .0000296678
 00000027  05   .000207674 .000163173 .000133505 .000103837 .0000949368 .0000830697 .0000652691 .0000445016

   SCC     STATE    GMT9         GMT10        GMT11       GMT12       GMT13       GMT14       GMT15       GMT16

 00000027  01  .0000296678 .0000326345 .000056369 .000148339 .000222508 .000186907 .000151306 .000145372
 00000027  03  .0000326345 .0000296678 .000029668 .000032635 .000056369 .000148339 .000222508 .000186907
 00000027  04  .0000296678 .0000326345 .000056369 .000148339 .000222508 .000186907 .000151306 .000145372
 00000027  05  .0000326345 .0000296678 .000029668 .000032635 .000056369 .000148339 .000222508 .000186907

   SCC     STATE  GMT17       GMT18       GMT19       GMT20       GMT21       GMT22       GMT23       GMT24

 00000027  01  .000154272 .000151306 .000154272 .000166139 .000192840 .000216575 .000207674 .000163173
 00000027  03  .000151306 .000145372 .000154272 .000151306 .000154272 .000166139 .000192840 .000216575
 00000027  04  .000154272 .000151306 .000154272 .000166139 .000192840 .000216575 .000207674 .000163173
 00000027  05  .000151306 .000145372 .000154272 .000151306 .000154272 .000166139 .000192840 .000216575

   SCC     STATE  GMT1        GMT2        GMT3        GMT4        GMT5         GMT6         GMT7         GMT8

 00000027  19  .000133505 .000103837 .000094937 .000083070 .0000652691 .0000445016 .0000326345 .0000296678
 00000027  20  .000103837 .000094937 .000083070 .000065269 .0000445016 .0000326345 .0000296678 .0000296678
 00000027  21  .000103837 .000094937 .000083070 .000065269 .0000445016 .0000326345 .0000296678 .0000296678
 00000027  22  .000103837 .000094937 .000083070 .000065269 .0000445016 .0000326345 .0000296678 .0000296678

   SCC     STATE  GMT9         GMT10        GMT11       GMT12       GMT13       GMT14       GMT15       GMT16

 00000027  19  .0000296678 .0000326345 .000056369 .000148339 .000222508 .000186907 .000151306 .000145372
 00000027  20  .0000326345 .0000563688 .000148339 .000222508 .000186907 .000151306 .000145372 .000154272
 00000027  21  .0000326345 .0000563688 .000148339 .000222508 .000186907 .000151306 .000145372 .000154272
 00000027  22  .0000326345 .0000563688 .000148339 .000222508 .000186907 .000151306 .000145372 .000154272

   SCC     STATE  GMT17       GMT18       GMT19       GMT20       GMT21       GMT22       GMT23       GMT24

 00000027  19  .000154272 .000151306 .000154272 .000166139 .000192840 .000216575 .000207674 .000163173
 00000027  20  .000151306 .000154272 .000166139 .000192840 .000216575 .000207674 .000163173 .000133505
 00000027  21  .000151306 .000154272 .000166139 .000192840 .000216575 .000207674 .000163173 .000133505
 00000027  22  .000151306 .000154272 .000166139 .000192840 .000216575 .000207674 .000163173 .000133505
```

Figure 4-9. TAM sample "detailed" diagnostic report - area sources.

SPECIATION MODULE

The Speciation Module processes emissions files output from one of the FREDS processing modules. This section presents descriptions of the files associated with the Speciation Module:

- SM Control Options File - Point Sources
- SM Control Options File - Area Sources
- Speciation Factor File
- PSPLIT File
- Speciated Emissions Files
- SM Diagnostic Reports

SM Control Options File

The SM Control Options File (EBCDIC characters) contains flags and variables to control the operation of the Speciation Module. The formats of control records for point and area source processing follows.

FILE NAME: SM Control Options File - Point Sources RECORD NAME: Run Identification Record

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=1)
3	4	2	A	SCE	Area or Point Source Identification (='PS', ='AS')
6	6	1	A	DETAIL	Level of Detail of the Diagnostic Report (='D', ='S')
8	15	8	A	SASMEM	Member Name of SAS Input and Output Files
17	72	56	A	RUN_ID	Run Identification Header

FILE NAME: SM Control Options File - Point Sources RECORD NAME: Speciation File Format Record

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=2)
3	7	5	I	MAJCAT	SAROAD Codes of Major Pollutants to be Speciated[a]
9	10	2	I	NUM_SP	Number of Species in Each Pollutant Category (MAX=32)

Note: This record type may be repeated NUMPOLL (up to 15) times, where NUMPOLL is the number of annual pollutants.

[a] THC and NO_x speciation is not specified on the Speciation File Format record.

FILE NAME: SM Control Options File - Area Sources RECORD NAME: Run Identification Record

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=1)
3	4	2	A	SCE	Area or Point Source Identification (='PS', ='AS')
6	6	1	A	DETAIL	Level of Detail of the Diagnostic Report (='D', ='S', ="T")
8	15	8	A	SASMEM	Member Name of SAS Input and Output Files
17	19	2	A	SFFLG	PSPLIT/SFF Speciation Flags (='YY', ="YN", ="NY")
20	75	56	A	RUN_ID	Run Identification Header

FILE NAME: SM Control Options File - Area Sources RECORD NAME: Speciation File Format Record

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=2)
3	10	8	A	MAJCAT	Names of Major Pollutants to be Speciated[a]
12	13	2	I	NUM_SP	Number of Species in Each Pollutant Category (MAX=32)

Note: This record type may be repeated NUMPOLL (up to 15) times, where NUMPOLL is the number of annual pollutants.

[a] Note SM requires "ATHC" and "ANO_x" to be specified first and second, respectively.

Speciation Factor File

Non-PSPLIT speciation factors are provided in an EBCDIC file containing the SAROAD codes for user-defined subclasses and the speciation factor for each subclass.

FILE NAME: Speciation Factor File RECORD NAME: Header No. 1

Page 1 of 1

Record Position First	Record Position Last	Column Width	Format	Variable Name	Description
1	7	7	I	CLASS1	Size Class/SAROAD Code Combination for Class 1
8	14	7	I	CLASS2	Size Class/SAROAD Code Combination for Class 2
15	21	7	I	CLASS3	Size Class/SAROAD Code Combination for Class 3
22	28	7	I	CLASS4	Size Class/SAROAD Code Combination for Class 4
29	35	7	I	CLASS5	Size Class/SAROAD Code Combination for Class 5
36	42	7	I	CLASS6	Size Class/SAROAD Code Combination for Class 6
43	49	7	I	CLASS7	Size Class/SAROAD Code Combination for Class 7
50	56	7	I	CLASS8	Size Class/SAROAD Code Combintation for Class 8
57	63	7	I	CLASS9	Size Class/SAROAD Code Combination for Class 9
64	70	7	I	CLASS10	Size Class/SAROAD Code Combination for Class 10
71	103	33	-	-	Unused
104	105	2	I	TYPE	Record Type (=11)

FILE NAME: Speciation Factor File RECORD NAME: Header No. 2

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	7	7	I	CLASS11	Size Class/SAROAD Code Combination for Class 11
8	14	7	I	CLASS12	Size Class/SAROAD Code Combination for Class 12
15	21	7	I	CLASS13	Size Class/SAROAD Code Combination for Class 13
22	28	7	I	CLASS14	Size Class/SAROAD Code Combination for Class 14
29	35	7	I	CLASS15	Size Class/SAROAD Code Combination for Class 15
36	103	68	-	-	Unused
104	105	2	I	TYPE	Record Type (=12)

FILE NAME: Speciation Factor File RECORD NAME: Speciation Record No. 1

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	2	2	I	STATE	AEROS State Code
3	6	4	I	COUNTY	AEROS County Code
7	10	4	A	PLANT_ID	Plant Identification Code[a]
11	13	3	A	POINT_ID	Point Identification Code[a]
14	21	8	I	SCC	SCC Code
22	29	8	F8V8	TSF1	Speciation Factor for Class 1[b]
30	37	8	F8V8	TSF2	Speciation Factor for Class 2
38	45	8	F8V8	TSF3	Speciation Factor for Class 3
46	53	8	F8V8	TSF4	Speciation Factor for Class 4
54	61	8	F8V8	TSF5	Speciation Factor for Class 5
62	69	8	F8V8	TSF6	Speciation Factor for Class 6
70	77	8	F8V8	TSF7	Speciation Factor for Class 7
78	85	8	F8V8	TSF8	Speciation Factor for Class 8
86	94	8	F8V8	TSF9	Speciation Factor for Class 9
95	102	8	F8V8	TSF10	Speciation Factor for Class 10
103	103	1	-	-	Unused
104	105	2	I	TYPE	Record Type (=21)

---

[a] For area source processing, these fields are left blank.

[b] Speciation factors are dimensionless weight fractions.

FILE NAME: Speciation Factor File (EBCDIC Format)
RECORD NAME: Speciation Record No. 2

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	2	2	I	STATE	AEROS State Code
3	6	4	I	COUNTY	AEROS County Code
7	10	4	A	PLANT_ID	Plant Identification Code[a]
11	13	3	A	POINT_ID	Point Identification Code[a]
14	21	8	I	SCC	SCC Code
22	29	8	F8V8	TSF11	Speciation Factor for Class 11[b]
30	37	8	F8V8	TSF12	Speciation Factor for Class 12
38	45	8	F8V8	TSF13	Speciation Factor for Class 13
46	53	8	F8V8	TSF14	Speciation Factor for Class 14
54	61	8	F8V8	TSF15	Speciation Factor for Class 15
62	103	41	-	-	Unused
104	105	2	I	TYPE	Record Type (=22)

---

[a] For area source runs, these fields are left blank.

[b] Speciation factors are dimensionless weight fractions.

PSPLIT File

The PSPLIT file (EBCDIC) provides SAROAD codes and speciation factors for THC and NO_x subclasses.

FILE NAME: PSPLIT File

RECORD NAME: Header No. 1

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	5	5	I	CLASS1	SAROAD of THC Class No. 1
6	10	5	I	CLASS2	SAROAD of THC Class No. 2
11	15	5	I	CLASS3	SAROAD of THC Class No. 3
16	20	5	I	CLASS4	SAROAD of THC Class No. 4
21	25	5	I	CLASS5	SAROAD of THC Class No. 5
26	30	5	I	CLASS6	SAROAD of THC Class No. 6
31	35	5	I	CLASS7	SAROAD of THC Class No. 7
36	40	5	I	CLASS8	SAROAD of THC Class No. 8
41	45	5	I	CLASS9	SAROAD of THC Class No. 9
46	50	5	I	CLASS10	SAROAD of THC Class No. 10
51	55	5	I	CLASS11	SAROAD of THC Class No. 11
56	60	5	I	CLASS12	SAROAD of THC Class No. 12
61	65	5	I	CLASS13	SAROAD of THC Class No. 13
66	70	5	I	CLASS14	SAROAD of THC Class No. 14
71	75	5	I	CLASS15	SAROAD of THC Class No. 15
76	80	5	I	CLASS16	SAROAD of THC Class No. 16
81	113	33	-	-	Unused
114	115	2	I	TYPE	Record Type (-11)

FILE NAME: PSPLIT File

RECORD NAME: Header No. 2

Page 1 of 1

Record Position		Column Width	Format	Variable Name	Description
First	Last				
1	5	5	I	CLASS17	SAROAD of THC Class No. 17
6	10	5	I	CLASS18	SAROAD of THC Class No. 18
11	15	5	I	CLASS19	SAROAD of THC Class No. 19
16	20	5	I	CLASS20	SAROAD of THC Class No. 20
21	25	5	I	CLASS21	SAROAD of THC Class No. 21
26	30	5	I	CLASS22	SAROAD of THC Class No. 22
31	35	5	I	CLASS23	SAROAD of THC Class No. 23
36	40	5	I	CLASS24	SAROAD of THC Class No. 24
41	45	5	I	CLASS25	SAROAD of THC Class No. 25
46	50	5	I	CLASS26	SAROAD of THC Class No. 26
51	55	5	I	CLASS27	SAROAD of THC Class No. 27
56	60	5	I	CLASS28	SAROAD of THC Class No. 28
61	65	5	I	CLASS29	SAROAD of THC Class No. 29
66	70	5	I	CLASS30	SAROAD of THC Class No. 30
71	75	5	I	CLASS31	SAROAD of THC Class No. 31
76	80	5	I	CLASS32	SAROAD of THC Class No. 32
81	113	33	-	-	Unused
114	115	2	I	TYPE	Record Type (-12)

FILE NAME: PSPLIT File RECORD NAME: Speciation Record No. 1

Page 1 of 2

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	2	2	I	STATE	AEROS State Code
3	6	4	I	COUNTY	AEROS County Code
7	10	4	A	PLANT_ID	Plant Identification Code[a]
11	13	3	A	POINT_ID	Point Identification Code[a]
14	21	8	I	SCC	SCC Code
22	26	5	F5V3	TSF1	Speciation Factor for THC Class No. 1 (moles/kg)
27	31	5	F5V3	TSF2	Speciation Factor for THC Class No. 2 (moles/kg)
32	36	5	F5V3	TSF3	Speciation Factor for THC Class No. 3 (moles/kg)
37	41	5	F5V3	TSF4	Speciation Factor for THC Class No. 4 (moles/kg)
42	46	5	F5V3	TSF5	Speciation Factor for THC Class No. 5 (moles/kg)
47	51	5	F5V3	TSF6	Speciation Factor for THC Class No. 6 (moles/kg)
52	56	5	F5V3	TSF7	Speciation Factor for THC Class No. 7 (moles/kg)
57	61	5	F5V3	TSF8	Speciation Factor for THC Class No. 8 (moles/kg)
62	66	5	F5V3	TSF9	Speciation Factor for THC Class No. 9 (moles/kg)
67	71	5	F5V3	TSF10	Speciation Factor for THC Class No. 10 (moles/kg)
72	76	5	F5V3	TSF11	Speciation Factor for THC Class No. 11 (moles/kg)

---

[a] For area source processing, these fields are left blank.

FILE NAME: PSPLIT File RECORD NAME: Speciation Record No. 1

Page 2 of 2

Record Position					
First	Last	Column Width	Format	Variable Name	Description
77	81	5	F5V3	TSF12	Speciation Factor for THC Class No. 12 (moles/kg)
82	86	5	F5V3	TSF13	Speciation Factor for THC Class No. 13 (moles/kg)
87	91	5	F5V3	TSF14	Speciation Factor for THC Class No. 14 (moles/kg)
92	96	5	F5V3	TSF15	Speciation Factor for THC Class No. 15 (moles/kg)
97	101	5	F5V3	TSF16	Speciation Factor for THC Class No. 16 (moles/kg)
102	105	4	F4V4	HCHOWT	Weight Fraction Formaldehyde in Profile (dimensionless)
106	109	4	F4V3	TSF33	Speciation Factor for NO (dimensionless weight fraction)
110	113	4	F4V3	TSF34	Speciation Factor for NO_2 (dimensionless weight fraction)
114	115	2	I	TYPE	Record Type (=21)

FILE NAME: PSPLIT File RECORD NAME: Speciation Record No. 2

Page 1 of 2

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	2	2	I	STATE	AEROS State Code
3	6	4	I	COUNTY	AEROS County Code
7	10	4	A	PLANT_ID	Plant Identification Code[a]
11	13	3	A	POINT_ID	Point Identification Code[a]
14	21	8	I	SCC	SCC Code
22	26	5	F5V3	TSF17	Speciation Factor for THC Class No. 17 (moles/kg)
27	31	5	F5V3	TSF18	Speciation Factor for THC Class No. 18 (moles/kg)
32	36	5	F5V3	TSF19	Speciation Factor for THC Class No. 19 (moles/kg)
37	41	5	F5V3	TSF20	Speciation Factor for THC Class No. 20 (moles/kg)
42	46	5	F5V3	TSF21	Speciation Factor for THC Class No. 21 (moles/kg)
47	51	5	F5V3	TSF22	Speciation Factor for THC Class No. 22 (moles/kg)
52	56	5	F5V3	TSF23	Speciation Factor for THC Class No. 23 (moles/kg)
57	61	5	F5V3	TSF24	Speciation Factor for THC Class No. 24 (moles/kg)
62	66	5	F5V3	TSF25	Speciation Factor for THC Class No. 25 (moles/kg)
67	71	5	F5V3	TSF26	Speciation Factor for THC Class No. 26 (moles/kg)
72	76	5	F5V3	TSF27	Speciation Factor for THC Class No. 27 (moles/kg)

---

[a] For area source runs, these fields are left blank.

FILE NAME: PSPLIT File RECORD NAME: Speciation Record No. 2

Page 2 of 2

Record Position		Column Width	Format	Variable Name	Description
First	Last				
77	81	5	F5V3	TSF28	Speciation Factor for THC Class No. 28 (moles/kg)
82	86	5	F5V3	TSF29	Speciation Factor for THC Class No. 29 (moles/kg)
87	91	5	F5V3	TSF30	Speciation Factor for THC Class No. 30 (moles/kg)
92	96	5	F5V3	TSF31	Speciation Factor for THC Class No. 31 (moles/kg)
97	101	5	F5V3	TSF32	Speciation Factor for THC Class No. 32 (moles/kg)
102	113	12	-	-	Unused
114	115	2	I	TYPE	Record Type (=22)

Speciated Emissions Files

Speciated Point Source Emissions File--

The Speciated Point Source Emissions File is SAS-formatted and contains plant and point location data (latitude, longitude, plant ID and point ID), emissions for up to 15 annual pollutants (tons/yr), and speciation factors (moles/kg, dimensionless fractions) for pollutant subspecies. If the Temporal Allocation or Spatial Allocation Modules have been executed prior to SM, temporal and/or spatial factors will be included on the emissions records. File format and variable descriptions for a speciated, temporally and spatially resolved point source file are depicted here.

Speciated Area Source Emissions File--

The Speciated Area Source Emissions Files contain area source location data (state, county) and speciated emissions for up to 15 pollutants (tons/yr) and subspecies (moles/yr, tons/yr). The total number of subspecies is specified in the Control Options File and supplied in the PSPLIT File and Speciation Factor File. The speciated emissions are output in SAS format. The output file descriptions for both the THC/NO_x and TSP/SO_2 files follow.

FILE NAME: Speciated Point Source File RECORD NAME: Point Source Record

Page 1 of 3

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	SCC	SCC Code
		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		4	A	PLANT_ID	Plant Identification Code
		2	A	POINT_ID	Point Identification Code
		8	I	AQCR	Air Quality Control Region
		8	I	SIC	SIC Code
		8	F	LAT	Fractional Latitude (degrees)
		8	F	LON	Fractional Longitude (degrees)
		8	I	COL	Grid Column
		8	I	ROW	Grid Row
		8	I	SAF	Spatial Allocation Fraction (-1 for point sources)
		8	I	ZONE	Time Zone Flag[b]
		8	I	DAYLITE	Daylight Savings Flag[c]

---

[a] SAS files are generally referenced by variable name; first/last positions are for EBCDIC/ASCII files.

[b] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

[c] For Time Zone Flag:
1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

FILE NAME: Speciated Point Source File RECORD NAME: Point Source Record

Page 2 of 3

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	FLOW	Exhaust Gas Flow Rate (ft^3/min)
		8	F	PLUME_HT	Plume Height (ft)
		8	F	STACK_DI	Stack Diameter (ft)
		8	F	STACK_HT	Stack Height (ft)
		8	F	STACK_TP	Stack Temperature (F)
		8	F	VELOCITY	Stack Gas Velocity (ft/min)
		8	F	HCHOWT	Weight Fraction of Formaldehyde in Speciation Profile
		8	I	NUMPOLL	Number of Pollutants
		8	I	SAROAD1-15	Pollutant SAROAD Code
		8	F	EMISS1-15	Pollutant Emissions (tons/yr)

NOTE: SAROAD and EMISS will be repeated NUMPOLL (up to 15) times, once for each pollutant.

First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	I	NUM_DAY	Number of Temporal Factor Sets in Record
		8	F	SEA1-12	Seasonal Temporal Allocation Factor
		8	F	DAY1-12	Daily Temporal Allocation Factor
		8	F	HFGMT1-288	Hourly Temporal Allocation Factor

NOTE: HFGMT1-24 corresponds to the hourly factors for scenario 1, HFGMT25-48 to secenario 2, and so on. All hourly factors are expressed as GMT.

FILE NAME: Speciated Point Source File RECORD NAME: Point Source Record

Page 3 of 3

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	I	NUMSP	Number of Speciation Factors
		8	I	CAT1-49	Major Pollutant SAROAD of Species
		8	I	CLASS1-49	SAROAD Code of Pollutant Subspecies[a]
		8	F	SF1-49	Speciation Factor of Species.[b]

NOTE: CAT, CLASS and SF will be repeated 49 times, once for each species.

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	I	CONEFF1-15	Control Efficiency of Point Pollutant
		8	I	ESTMET1-15	Estimation Method Used for Point Pollutant[c]

NOTE: CONEFF and ESTMET will be repeated NUMPOLL (up to 15) times, once for each pollutant.

---

[a] Subspecies codes for particulates are seven-digit size class-SAROAD code combinations.

[b] Units for speciation factors are moles/kg or dimensionless weight fractions. Units for specific subspecies are provided with the SFF and PSPLIT file formats.

[c] A listing of NEDS point source estimation methods is given in Appendix H.

FILE NAME: Speciated Area Source File - THC/NO_x File RECORD NAME: Area Source Record

Page 1 of 3

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		2	I	STATE	AEROS State Code
		4	I	COUNTY	AEROS County Code
		8	I	SCC	Area Source Category Code
		8	I	DAYLITE	Daylight Savings Indicator[b] for GMT offset and temporal processing
		8	I	ZONE	Time Zone Flag[c]
		8	F	ANO_x	NO_x Emissions (tons/yr)
		8	F	AVOC	VOC Emissions (tons/yr)
		8	F	ATHC	THC Emissions (tons/yr)
		8	F	SE1	Methane Emissions (moles/yr)
		8	F	SE2	Ethane Emissions (moles/yr)
		8	F	SE3	Propane Emissions (moles/yr)
		8	F	SE4	Alkane (reactivity 1) Emissions (moles/yr)
		8	F	SE5	Alkane (reactivity 2) Emissions (moles/yr)
		8	F	SE6	Alkane (reactivity 3) Emissions (moles/yr)
		8	F	SE7	Alkane (reactivity 4) Emissions (moles/yr)

---

[a] SAS Files are generally referenced by variable name rather than position.

[b] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

[c] For Time Zone Flag:
1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

FILE NAME: Speciated Area Source File - THC/NO_x File

RECORD NAME: Area Source Record

Page 2 of 3

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	SE8	Alkane/Aromatic Mix Emissions (moles/yr)
		8	F	SE9	Ethene Emissions (moles/yr)
		8	F	SE10	Propene Emissions (moles/yr)
		8	F	SE11	Primary Alkene Emissions (moles/yr)
		8	F	SE12	Internal Alkene Emissions (moles/yr)
		8	F	SE13	Primary/Internal Mix Alkene Emissions (moles/yr)
		8	F	SE14	Benzene/Halobenzene Emissions (moles/yr)
		8	F	SE15	Aromatic (reactivity 1) Emission (moles/yr)
		8	F	SE16	Aromatic (reactivity 2) Emissions (moles/yr)
		8	F	SE17	Phenol/Cresols Emissions (moles/yr)
		8	F	SE18	Styrenes Emissions (moles/yr)
		8	F	SE19	Formaldehyde Emissions (moles/yr)
		8	F	SE20	Higher Aldehydes Emissions (moles/yr)
		8	F	SE21	Acetone Emissions (moles/yr)
		8	F	SE22	Higher Ketones Emissions (moles/yr)
		8	F	SE23	Organic Acids Emissions (moles/yr)
		8	F	SE24	Acetylene Emissions (moles/yr)
		8	F	SE25	Haloalkenes Emissions (moles/yr)
		8	F	SE26	Unreactive Hydrocarbon Emissions (moles/yr)

FILE NAME: Speciated Area Source File - THC/NO_x File

RECORD NAME: Area Source Record

Page 3 of 3

Record Position

First	Last	SAS Length Width	Type	Variable Name	Description
		8	F	SE27	Other Hydrocarbon (reactivity 1) Emissions (moles/yr)
		8	F	SE28	Other Hydrocarbons (reactivity 2) (moles/yr)
		8	F	SE29	Other Hydrocarbon (reactivity 3) Emissions (moles/yr)
		8	F	SE30	Other Hydrocarbon (reactivity 4) Emissions (moles/yr)
		8	F	SE31	Unidentified Hydrocarbon Emissions (moles/year)
		8	F	SE32	Unassigned Hydrocarbon Emissions (moles/yr)
		8	F	SE33	NO Emissions (tons/year)
		8	F	SE34	NO_2 Emissions (tons/year)

FILE NAME: Speciated Area Source File - TSP/SO_2 File

RECORD NAME: Area Source Record

Page 1 of 2

Record Position					
First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		2	I	STATE	AEROS State Code
		4	I	COUNTY	AEROS County Code
		8	I	SCC	Area Source Category Code
		8	I	DAYLITE	Daylight Savings Indicator[b] for GMT offset and temporal processing
		8	I	ZONE	Time Zone Flag[c]
		8	F	ASO_2	SO_2 Emissions (tons/yr)
		8	F	ASO_4	SO_4 Emissions (tons/yr)
		8	F	ATSP	TSP Emissions (tons/yr)
		8	F	ACO	CO Emissions (tons/yr)
		8	F	ANH_3	NH_3 Emissions (tons/yr)
		8	F	SE35	Reactive Calcium Emissions, 0-2.5 um (tons/yr)
		8	F	SE36	Reactive Calcium Emissions, 2.5-10 um (tons/yr)
		8	F	SE37	Total Reactive Calcium Emissions (tons/yr)
		8	F	SE38	Reactive Magnesium Emissions, 0-2.5 um (tons/yr)
		8	F	SE39	Reactive Magnesium Emissions, 2.5-10 um (tons/yr)
		8	F	SE40	Total Reactive Magnesium Emissions (tons/yr)

---

[a] SAS Files are generally referenced by variable name rather than position.

[b] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

[c] For Time Zone Flag:
1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

FILE NAME: Speciated Area Source File - TSP/SO_2 File

RECORD NAME: Area Source Record

Page 2 of 2

Record Position First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	SE41	Reactive Potassium Emissions, 0-2.5 um (tons/yr)
		8	F	SE42	Reactive Potassium Emissions, 2.5-10 um (tons/yr)
		8	F	SE43	Total Reactive Potassium Emissions (tons/yr)
		8	F	SE44	Reactive Sodium Emissions, 0-2.5 um (tons/yr)
		8	F	SE45	Reactive Sodium Emissions, 2.5-10 um (tons/yr)
		8	F	SE46	Total Reactive Sodium Emissions (tons/yr)
		8	F	SE47	Total Particulate Emissions, 0-2.5 um (tons/yr)
		8	F	SE48	Total Particulate Emissions, 2.5-6 um (tons/yr)
		8	F	SE49	Total Particulate Emissions, 6-10 um (tons/yr)

SM Diagnostic Report

The Speciation Module diagnostic report contains the run date and time and a control options listing including the pollutants to be speciated and the subspecies for each major category. If a detailed listing is requested, speciation factors for point sources will be printed. For area sources, a listing of speciated emissions will be printed. If requested, speciated emissions sums will also be printed for area source emissions. Sample diagnostic reports for point and area source runs are illustrated in Figures 4-10 and 4-11 for a subset of the 1985 NAPAP data base.

```
DATE: 23JAN89       TIME: 18:52:48
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)                                                      SPECIATION MODULE
DIAGNOSTIC REPORT                             FREDS 1985 INVENTORY - U.S. POINT SOURCES V30           DETAILED LISTING
------------------------------------------------------ CONTROL FILE LISTING ------------------------------------------------
RUN IDENTIFICATION RECORD:
     SCE: PS  DETAIL: D  SAS FILE: DATA RUN ID: FREDS 1985 INVENTORY - U.S. POINT SOURCES V30

SPECIATION FACTOR FILE DEFINITION RECORDS:
                                                              MAJOR
                                                            POLLUTANT    # OF
                                                  RECORD #   SAROAD   SUBCLASSES
                                                  ----------------------------
                                                      1       11101       15
                                                  ----------------------------

                                         EMPLOYED SPECIATION FACTORS - FIRST 50 OBSERVATIONS    18:38 MONDAY, JANUARY 23, 1989
                                                    (HYDROCARBON FACTORS IN MOLES/KG)

                    P  P
                    L  O
               C    A  I        N
          S    O    N  N  N     C                                                           C     C     C     C     C     C     C
          T    U    T  T  U     M     C     C     C     C     C     C     C     C     C     A     A     A     A     A     A     A
    S     A    N    _  _  M     O     A     A     A     A     A     A     A     A     A     T     T     T     T     T     T     T
    C     T    T    I  I  S     W     T     T     T     T     T     T     T     T     T     1     1     1     1     1     1     1
    C     E    Y    D  D  P     T     1     2     3     4     5     6     7     8     9     0     1     2     3     4     5     6

10100101 07 0265 0195 03 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 451010
10100101 39 4700 0054 01 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010
10100101 39 5220 0014 01 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010
10100101 39 8320 0002 01 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010
10100101 39 8320 0002 02 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010
10100101 39 8320 0002 03 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010
10100101 39 8320 0002 04 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010
10100101 45 0810 0005 11 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010
10100101 49 1100 0010 10 49 .0000 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 431010

                    P  P
                    L  O
               C    A  I
          S    O    N  N     C     C     C     C     C     C     C     C     C     C     C     C     C     C     C     C     C
          T    U    T  T     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A
    S     A    N    _  _     T     T     T     T     T     T     T     T     T     T     T     T     T     T     T     T     T
    C     T    T    I  I     1     1     1     2     2     2     2     2     2     2     2     2     2     3     3     3     3
    C     E    Y    D  D     7     8     9     0     1     2     3     4     5     6     7     8     9     0     1     2     3

10100101 07 0265 0195 03 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 39 4700 0054 01 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 39 5220 0014 01 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 39 8320 0002 01 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 39 8320 0002 02 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 39 8320 0002 03 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 39 8320 0002 04 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 45 0810 0005 11 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603
10100101 49 1100 0010 10 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 43101 42603

                    P  P
                    L  O
               C    A  I                                                                                                     C
          S    O    N  N     C     C     C     C     C     C     C     C     C     C     C     C     C     C     C     C L
          T    U    T  T     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A     A A
    S     A    N    _  _     T     T     T     T     T     T     T     T     T     T     T     T     T     T     T     T S
    C     T    T    I  I     3     3     3     3     3     3     4     4     4     4     4     4     4     4     4     4 S
    C     E    Y    D  D     4     5     6     7     8     9     0     1     2     3     4     5     6     7     8     9 1

10100101 07 0265 0195 03 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 39 4700 0054 01 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 39 5220 0014 01 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 39 8320 0002 01 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 39 8320 0002 02 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 39 8320 0002 03 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 39 8320 0002 04 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 45 0810 0005 11 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
10100101 49 1100 0010 10 42603 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 11101 1
```

Figure 4-10. SM sample "detailed" diagnostic report - point sources.

Reproduced from best available copy.

```
DATE: 04JAN89      TIME: 17:27:53
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)
DIAGNOSTIC REPORT                   1985 FREDS - AREA SOURCE SM, VERSION 2             SPECIATION MODULE (SM)
                                                                                          DETAILED LISTING
------------------------------------------------ CONTROL FILE LISTING ------------------------------------------

RUN IDENTIFICATION RECORD:
    SOURCE: AS  DETAIL: D  SAS FILE: DATA  PSPLIT,SFF FLAGS: YN  RUN ID: 1985 FREDS - AREA SOURCE SM, V30

POLLUTANT SPECIES DEFINITION RECORDS:

                                          MAJOR      # OF
                              RECORD #  POLLUTANT   SPECIES
                              ----------------------------
                                 1        ATHC        32
                                 2        ANOX         2
                                 3        ATSP        15
                              ---------------------------



                                      SPECIE DESCRIPTIONS
                         SF    POLLUTANT                   POLLUTANT
                       NUMBER   SAROAD                    DESCRIPTION
                       ------------------------------------------------------
                          1        1    METHANE
                          2        2    ETHANE
                          3        3    PROPANE
                          4        4    ALKANES REACTIVITY1
                          5        5    ALKANES REACTIVITY2
                          6        6    ALKANES REACTIVITY3
                          7        7    ALKANES REACTIVITY4
                          8        8    ALKANE/AROMATIC MIX
                          9        9    ETHENE
                         10       10    PROPENE
                         11       11    ALKENES PRIMARY
                         12       12    ALKENES INTERNAL
                         13       13    ALKENES PRIMARY/INTERNAL MIX
                         14       14    BENZENE/HALOBENZENES
                         15       15    AROMATICS REACTIVITY1
                         16       16    AROMATICS REACTIVITY2
                         17       17    PHENOLS/CRESOLS
                         18       18    STYRENES
                         19       19    FORMALDEHYDE
                         20       20    HIGHER ALDEHYDES
                         21       21    ACETONE
                         22       22    HIGHER KETONES
                         23       23    ORGANIC ACIDS
                         24       24    ACETYLENE
                         25       25    HALOALKANES
                         26       26    UNREACTIVE HYDROCARBONS
                         27       27    OTHER HYDROCARBONS REACTIVITY1
                         28       28    OTHER HYDROCARBONS REACTIVITY2
                         29       29    OTHER HYDROCARBONS REACTIVITY3
                         30       30    OTHER HYDROCARBONS REACTIVITY4
                         31       31    UNIDENTIFIED HYDROCARBONS
                         32       32    UNASSIGNED HYDROCARBONS
                         33    42601    NO
                         34    42602    NO2
```

Figure 4-11. SM sample "detailed" diagnostic report - area sources (THC/NO_x File).

```
                                                   ANNUAL TOTALS OF SPECIATED EMISSIONS     17:02 WEDNESDAY, JANUARY 4, 1989

                                                        VARIABLE          SUM

                                                        SE1          143118748981
                                                        SE2           12378352361
                                                        SE3            8113448626
                                                        SE4           23383275281
                                                        SE5           24194060045
                                                        SE6           19563070449
                                                        SE7            2661962159
                                                        SE8            1695457206
                                                        SE9           38558702442
                                                        SE10           4037126036
                                                        SE11           4226368401
                                                        SE12           9941741929
                                                        SE13           1703304338
                                                        SE14           9203309245
                                                        SE15          11778664762
                                                        SE16          15465400048
                                                        SE17            332719825
                                                        SE18           1128926597
                                                        SE19           8187498843
                                                        SE20           2799560569
                                                        SE21           1454419078
                                                        SE22           1272635243
                                                        SE23            773170982
                                                        SE24           7537911634
                                                        SE25           2204091070
                                                        SE26           2501340315
                                                        SE27           2319041668
                                                        SE28          22648997664
                                                        SE29          13341584063
                                                        SE30           3509171840
                                                        SE31          10661870914
                                                        SE32           3962156400
                                                        SE33             10500893
                                                        SE34               573345

                                                    APPLIED SPECIATION FACTORS                    17:02 WEDNESDAY, JANUARY 4, 1989
                                                     (FIRST 200 OBSERVATIONS)

 SCC    STATE COUNTY SE1   SE2       SE3     SE4      SE5     SE6  SE7 SE8 SE9    SE10     SE11 SE12 SE13   SE14      SE15    SE16

00000001 07   0265   0  18513.6  3692.1   5050.0  3882.9 1079.46  0   0   0  572.59  3398.0  0    0  1514.38  4521.2  4233.4
00000001 07   0425   0  41058.4  8188.1  11199.6  8611.4 2393.97  0   0   0 1269.85  7535.8  0    0  3358.50 10026.9  9388.5
00000001 07   0478   0  12609.0  2514.6   3439.4  2644.5  735.19  0   0   0  389.97  2314.2  0    0  1031.39  3079.3  2883.2
00000001 07   0565   0  21197.5  4227.3   5782.1  4445.8 1235.95  0   0   0  655.59  3890.6  0    0  1733.92  5176.7  4847.1
00000001 07   0705   0  23613.0  4709.0   6441.0  4952.5 1376.79  0   0   0  730.30  4333.9  0    0  1931.50  5766.6  5399.4
00000001 07   0725   0  19855.5  3959.7   5416.1  4164.4 1157.71  0   0   0  614.09  3644.3  0    0  1624.15  4849.0  4540.2
00000001 07   1155   0  11267.0  2246.9   3073.3  2363.1  656.94  0   0   0  348.47  2067.9  0    0   921.62  2751.5  2576.4
00000001 07   1505   0   9119.9  1818.7   2487.7  1912.8  531.75  0   0   0  282.06  1673.9  0    0   745.99  2227.2  2085.4
00000001 08   0060   0   2946.9   587.7    803.8   618.1  171.83  0   0   0   91.14   540.9  0    0   241.05   719.7   673.9
00000001 08   0180   0  10998.6  2193.4   3000.1  2306.8  641.29  0   0   0  340.16  2018.7  0    0   899.67  2686.0  2515.0
00000001 08   0240   0   2946.9   587.7    803.8   618.1  171.83  0   0   0   91.14   540.9  0    0   241.05   719.7   673.9
00000001 14   0040   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   0540   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   1320   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   1540   0  69239.4 13808.1  18886.7 14521.9 4037.11  0   0   0 2141.43 12708.1  0    0  5663.66 16909.1 15832.5
```

Figure 4-11 (continued)

```
00000001 14   2600  0  14487.7  2889.2  3951.9  3038.6  844.73  0  0  0  448.07  2659.1  0   0  1185.07  3538.1  3312.8
00000001 14   2680  0   2141.8   427.1   584.2   449.2  124.88  0  0  0   66.24   393.1  0   0   175.19   523.0   489.7
00000001 14   2760  0    799.8   159.5   218.2   167.7   46.63  0  0  0   24.74   146.8  0   0    65.42   195.3   182.9
00000001 14   3060  0    799.8   159.5   218.2   167.7   46.63  0  0  0   24.74   146.8  0   0    65.42   195.3   182.9
00000001 14   3280  0   2141.8   427.1   584.2   449.2  124.88  0  0  0   66.24   393.1  0   0   175.19   523.0   489.7
00000001 14   3580  0   6167.6  1230.0  1682.4  1293.6  359.61  0  0  0  190.75  1132.0  0   0   504.50  1506.2  1410.3
00000001 14   3640  0   2141.8   427.1   584.2   449.2  124.88  0  0  0   66.24   393.1  0   0   175.19   523.0   489.7
00000001 14   3720  0    799.8   159.5   218.2   167.7   46.63  0  0  0   24.74   146.8  0   0    65.42   195.3   182.9
00000001 14   3920  0   2141.8   427.1   584.2   449.2  124.88  0  0  0   66.24   393.1  0   0   175.19   523.0   489.7
00000001 14   4100  0    799.8   159.5   218.2   167.7   46.63  0  0  0   24.74   146.8  0   0    65.42   195.3   182.9

  SCC    STATE COUNTY SE17 SE18 SE19 SE20 SE21 SE22 SE23   SE24   SE25 SE26 SE27 SE28 SE29 SE30 SE31 SE32   SE33    SE34

00000001  07    0265'  0    0    0    0    0    0    0   18544.9  0    0    0    0    0    0    0    0   0.98230 0.05170
00000001  07    0425   0    0    0    0    0    0    0   41127.8  0    0    0    0    0    0    0    0   2.17930 0.11470
00000001  07    0478   0    0    0    0    0    0    0   12630.3  0    0    0    0    0    0    0    0   0.66880 0.03520
00000001  07    0565   0    0    0    0    0    0    0   21233.3  0    0    0    0    0    0    0    0   1.12480 0.05920
00000001  07    0705   0    0    0    0    0    0    0   23652.9  0    0    0    0    0    0    0    0   1.25305 0.06595
00000001  07    0725   0    0    0    0    0    0    0   19889.1  0    0    0    0    0    0    0    0   1.05355 0.05545
00000001  07    1155   0    0    0    0    0    0    0   11286.1  0    0    0    0    0    0    0    0   0.59755 0.03145
00000001  07    1505   0    0    0    0    0    0    0    9135.3  0    0    0    0    0    0    0    0   0.48355 0.02545
00000001  08    0060   0    0    0    0    0    0    0    2951.9  0    0    0    0    0    0    0    0   0.15580 0.00820
00000001  08    0180   0    0    0    0    0    0    0   11017.2  0    0    0    0    0    0    0    0   0.58330 0.03070
00000001  08    0240   0    0    0    0    0    0    0    2951.9  0    0    0    0    0    0    0    0   0.15580 0.00820
```

Figure 4-11 (continued)

SPATIAL ALLOCATION MODULE

This section describes the files accessed by the Spatial Allocation Module. The SAM accepts SAS-formatted emissions files output from any of the FREDS processing modules. The following files are input or created by SAM:

- SAM Control Options File
- Spatial Allocation Factor File (Area Sources)
- Spatially Allocated Emissions Files
- SAM Orphan Files
- SAM Diagnostic Report

SAM Control Options File

Control options for SAM are specified in an EBCDIC file. There are two record types for point sources: Run Identification and Grid Specification. These records are input for area sources as well as the Subfile Definition and Pollutant List records. SAM distinguishes between record types by a record identification field located in the first column of each record.

The Run Identification record informs SAM of the source file type to be processed and the level of output detail, and assigns the module run an identification label. Only one Run Identification record may be specified per COF. The Grid Specification record provides information concerning the dimensions of the grid system including boundaries and increments. Only one record per run may be included.

The Subfile Definition record tells SAM the first and last record numbers of the area source emissions subfile being processed. This allows the user to limit the number of area source records processed in a single run.

The Pollutant List records consist of input and output variable names for pollutants being processed. This allows for multiplication of emissions and their corresponding spatial allocation factors. The format of each control option record is listed on the following pages.

FILE NAME: SAM Control Options File

RECORD NAME: Run Identification Record - Point and Area Sources

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (=1)
3	4	2	A	SOURCE	Source Type to be Input (='PS', ='AS')
6	6	1	A	DETAIL	Level of detail of the Diagnostic Report (='S', ='D', and for area sources only, ='T')
8	15	8	A	SASMEM	Member name of SAS Input and Output Files
17	72	56	A	RUN_ID	Run Identification Header

FILE NAME: SAM Control Options File

RECORD NAME: Grid Specification Record - Point and Area Sources

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (=2)
3	4	2	F2.0	SLAT	Southernmost Latitude of Grid (degrees)
6	7	2	F2.0	NLAT	Northernmost Latitude of Grid (degrees)
9	10	2	I	ILAT	Number of Grids Per Degree of Latitude
12	14	3	F3.0	WLON	Westernmost Longitude of Grid (degrees)
16	18	3	F3.0	ELON	Easternmost Longitude of Grid (degrees)
20	21	2	I	ILON	Number of Grids Per Degree of Longitude

FILE NAME: SAM Control Options File RECORD NAME: Subfile Definition Record - Area Sources

Page 1 of 1

Record Position

First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (-3)
3	9	7	I	FIRST	Emission Record Number of First Area Source Subfile Record Processed
11	17	7	I	LAST	Emission Record Number of Last Area Source Subfile Record Processed

FILE NAME: SAM Control Options File RECORD NAME: Pollutant List Record - Area Sources

Page 1 of 1

Record Position: Line 1

First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Record Identification (-4)
3	72	70	A	LIST	Input Pollutant Variable Names[a]

Record Position: Line 2

First	Last	Column Width	Format	Variable Name	Description
3	72	70	A	LISTS	Output Pollutant Variable Names[b]

---

[a] For 1985 NAPAP processing, the input pollutant variable names are defined as follows: ANO_x, AVOC, ATHC, SE1-SE34 for the THC/NO_x split file and ASO_2, ATSP, ACO, ANH_3, SE35-SE49 for the TSP/SO_2 split file. The order and names are user defined when each module is executed.

[b] The output pollutant variable list order corresponds to the input format. For 1985 processing, the output pollutant variable list is as follows: NO_x, VOC, THC, SESA1-SESA34 for the THC/NO_x split file and SO_2, SO_4, TSP, CO, NH_3, SESA35-SESA49 for the TSP/SO_2 split file.

Spatial Allocation Factor File

The spatial allocation factors are produced by peripheral software originally designed for the Regional Model Data Handling System (RMDHS). Up to 30 allocation factors (surrogates) can be created by this software. Surrogate selections can be made on the county-specific, state-specific, or global level. Only 160 grids per county, state, or global group may be specified. The Spatial Allocation Factor File is an EBCDIC file containing one record type. Each record contains all of the spatial allocation information for a particular SCC code in a specific county. The detailed format follows.

FILE NAME: Spatial Allocation Factor File

RECORD NAME: Spatial Allocation Factor Record

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	2	2	I	STATE	AEROS State Code
3	6	4	I	COUNTY	AEROS County Code
7	9	3	I	SCC	SCC Code
10	12	3	I	NGRID	Number of Grids in County
13	16	4	I	NROW	Row of Grid Cell
17	20	4	I	NCOL	Column of Grid Cell
21	25	5	F5V4	NSAF	Spatial Allocation Factor for Grid Cell[a]

NOTE: Columns 13-25 are repeated up to NGRID times.

[a] Spatial allocation factors are dimensionless fractions representing the portion of a county's land use for a specific land use category in a grid cell.

Spatially Allocated Emissions Files

Spatially Allocated Point Source File--

The Spatially Allocated Point Source File contains identification and location data, emissions for up to 15 annual pollutants (tons/yr), and a spatial allocation factor equal to 1 for each emission record. In addition, temporal and speciation factors may also be present if TAM and/or SM were executed prior to SAM. The file is output in SAS format. The order of the variables presented on the following pages are not necessarily the order of the SAS output file. The output file and variable definitions for the module execution specified in System Charts follow.

Spatially Allocated Area Source File--

The Spatially Allocated Area Source Emissions File contains area source location data and spatially allocated emissions for up to 15 major pollutant categories. If the speciation module has been executed prior to the SAM, spatially resolved emissions for a user-specified number of subspecies will also be present. If hourly emissions are input to SAM, the output will contain spatially resolved hourly emissions. The output file(s) are SAS formatted; the variable descriptions based on module execution specified in System Charts for area sources follow.

FILE NAME: Spatially Allocated Point Source Emissions File **RECORD NAME:** Point Source Record

Page 1 of 2

Record Position:

First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		8	I	AQCR	Air Quality Control Region
		4	A	PLANT_ID	Plant Identification Code
		2	A	POINT_ID	Point Identification Code
		8	F	LAT	Fractional Latitude (degrees)
		8	F	LON	Fractional Longitude (degrees)
		8	I	COL	Grid Column
		8	I	ROW	Grid Row
		8	I	SAF	Spatial Allocation Fraction (-1 for point sources)
		8	I	SIC	SIC Code
		8	I	SCC	SCC Code
		8	F	WINTHRU	Winter Throughput Percent
		8	F	SPRTHRU	Spring Throughput Percent
		8	F	SUMTHRU	Summer Throughput Percent
		8	F	FALTHRU	Fall Throughput Percent
		8	F	HOURS	Hours per Day
		8	F	DAYS	Days per Week
		8	F	WEEKS	Weeks per Year
		8	I	NUMPOLL	Number of Pollutants
		8	I	SAROAD1-15	Pollutant SAROAD Code
		8	F	EMISS1-15	Pollutant Emissions (tons/yr)

---

[a] SAS files are variable defined, and thus, variables in SAS data sets are referenced by name.

FILE NAME: Spatially Allocated Point Source Emissions File

RECORD NAME: Point Source Record

Page 2 of 2

Record Position:

First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	PLUME_HT	Plume Height (ft)
		8	F	STACK_TP	Stack Temperature (°F)
		8	F	STACK_HT	Stack Height (ft)
		8	F	STACK_DI	Stack Diameter (ft)
		8	F	FLOW	Exhaust Flow Rate (ft^3/min)
		8	F	VELOCITY	Exit Velocity (ft/min)
		8	F	CONEFF1-15	Estimated Control Efficiency (%)
		8	I	ESTMET1-15	Estimation Method Used for Point Pollutant[b]

NOTE: SAROAD, EMISS, CONEFF and ESTMET will be repeated NUMPOLL (up to 15) times, once for each pollutant.

---

[b] A listing of point source estimation methods is given in Appendix H.

FILE NAME:	Spatially Allocated Area Source Emissions File - THC/NO_x Split
RECORD NAME:	Area Source Record

Page 1 of 3

Record Position:

First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		8	I	SCC	Area Source Category Code
		8	I	DAYLITE	Daylight Savings Indicator[b] for GMT offset and temporal processing
		8	I	ZONE	Time Zone Flag[c]
		8	I	COL	Grid Column
		8	I	ROW	Grid Row
		8	F	NO_x	NO_x Emissions (tons/yr)
		8	F	VOC	VOC Emissions (tons/yr)
		8	F	THC	THC Emissions (tons/yr)
		8	F	SESA1	Methane Emissions (moles/yr)
		8	F	SESA2	Ethane Emissions (moles/yr)
		8	F	SESA3	Propane Emissions (moles/yr)
		8	F	SESA4	Alkane (reactivity 1) Emissions (moles/yr)
		8	F	SESA5	Alkane (reactivity 2) Emissions (moles/yr)

---

[a] SAS Files are variable defined, and thus, variables in SAS data sets are referenced by name.

[b] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

[c] For Time Zone Flag:
1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

FILE NAME: Spatially Allocated Area Source File - THC/NO_x Split

RECORD NAME: Area Source Record

Page 2 of 3

Record Position First	Last	SAS Length (Btyes)	Type	Variable Name	Description
		8	F	SESA6	Alkane (reactivity 3) Emissions (moles/yr)
		8	F	SESA7	Alkane (reactivity 4) Emissions (moles/yr)
		8	F	SESA8	Alkane/Aromatic Mix Emissions (moles/yr)
		8	F	SESA9	Ethene Emissions (moles/yr)
		8	F	SESA10	Propene Emissions (moles/yr)
		8	F	SESA11	Primary Alkene Emissions (moles/yr)
		8	F	SESA12	Internal Alkene Emissions (moles/yr)
		8	F	SESA13	Primary/Internal Mix Alkene Emissions (moles/yr)
		8	F	SESA14	Benzene/Halobenzene Emissions (moles/yr)
		8	F	SESA15	Aromatic (reactivity 1) Emissions (moles/yr)
		8	F	SESA16	Aromatic (reactivity 2) Emissions (moles/yr)
		8	F	SESA17	Phenol/Cresols Emissions (moles/yr)
		8	F	SESA18	Styrenes Emissions (moles/yr)
		8	F	SESA19	Formaldehyde Emissions (moles/yr)
		8	F	SESA20	Higher Aldehyde Emissions (moles/yr)

FILE NAME: Spatially Allocated Area Source File - THC/NO_x Split

RECORD NAME: Area Source Record

Page 3 of 3

Record Position					
First	Last	SAS Length (Btyes)	Type	Variable Name	Description
		8	F	SESA21	Acetone Emissions (moles/yr)
		8	F	SESA22	Higher Ketones Emissions (moles/yr)
		8	F	SESA23	Organic Acids Emissions (moles/yr)
		8	F	SESA24	Acetylene Emissions (moles/yr)
		8	F	SESA25	Haloalkenes Emissions (moles/yr)
		8	F	SESA26	Unreactive Hydrocarbon Emissions (moles/yr)
		8	F	SESA27	Other Hydrocarbon (reactivity 1) Emissions (moles/yr)
		8	F	SESA28	Other Hydrocarbon (reactivity 2) Emissions (moles/yr)
		8	F	SESA29	Other Hydrocarbon (reactivity 3) Emissions (moles/yr)
		8	F	SESA30	Other Hydrocarbon (reactivity 4) Emissions (moles/yr)
		8	F	SESA31	Unidentified Hydrocarbon Emissions (moles/yr)
		8	F	SESA32	Unassigned Hydrocarbon Emissions (moles/yr)
		8	F	SESA33	NO Emissions (tons/yr)
		8	F	SESA34	NO_2 Emissions (tons/yr)

FILE NAME: Spatially Allocated Area Source File - TSP/SO_2 Split

RECORD NAME: Area Source Record

Page 1 of 2

Record Position:

First	Last	SAS Length (Bytes)	Type	Variable Name	Description
N/A[a]		8	I	STATE	AEROS State Code
		8	I	COUNTY	AEROS County Code
		8	I	SCC	"Pseudo" SCC Code
		8	I	DAYLITE	Daylight Savings Indicator[b] for GMT offset and temporal processing
		8	I	ZONE	Time Zone Flag[c]
		8	I	COL	Grid Column
		8	I	ROW	Grid Row
		8	F	SO_2	SO_2 Emissions (tons/yr)
		8	F	SO_4	SO_4 Emissions (tons/yr)
		8	F	TSP	TSP Emissions (tons/yr)
		8	F	CO	CO Emissions (tons/yr)
		8	F	NH_3	NH_3 Emissions (tons/yr)
		8	F	SESA35	Calcium Emissions, 0-2.5 um (tons/yr)

---

[a] SAS files are variable defined, and thus, variables in SAS data sets are referenced by name.

[b] 0 - No, Daylight Savings Time is not adhered to in this area.
1 - Yes, Daylight Savings Time is adhered to in this area.

[c] For Time Zone Flag: 1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

FILE NAME: Spatially Allocated Area Source File - TSP/SO_2 Split

RECORD NAME: Area Source Record

Page 2 of 2

Record Position:

First	Last	SAS Length (Bytes)	Type	Variable Name	Description
		8	F	SESA36	Calcium Emissions, 2.5-10 um (tons/yr)
		8	F	SESA37	Calcium Emissions, Total Particulate (tons/yr)
		8	F	SESA38	Magnesium Emissions, 0-2.5 um (tons/yr)
		8	F	SESA39	Magnesium Emissions, 2.5-10 um (tons/yr)
		8	F	SESA40	Magnesium Emissions, Total Particulate (tons/yr)
		8	F	SESA41	Potassium Emissions, 0-2.5 um (tons/yr)
		8	F	SESA42	Potassium Emissions, 2.5-10 um (tons/yr)
		8	F	SESA43	Potassium Emissions, Total Particulate (tons/yr)
		8	F	SESA44	Sodium Emissions, 0-2.5 um (tons/yr)
		8	F	SESA45	Sodium Emissions, 2.5-10 um (tons/yr)
		8	F	SESA46	Sodium Emissions, Total Particulate (tons/yr)
		8	F	SESA47	Total Particulates, 0-2.5 um (tons/yr)
		8	F	SESA48	Total Particulates, 2.5-6 um (tons/yr)
		8	F	SESA49	Total Particulates, 6-10 um (tons/yr)

SAM Orphan Files

SAM outputs three SAS-formatted orphan files - two for point source executions and one for area sources. Since these are SAS files, they are variable defined, however, the order of the variables in the I/O formats does not necessarily represent the order within the SAS data sets. The specifics for the point and area source orphan files are discussed below.

SAM Point Source Orphan Files--

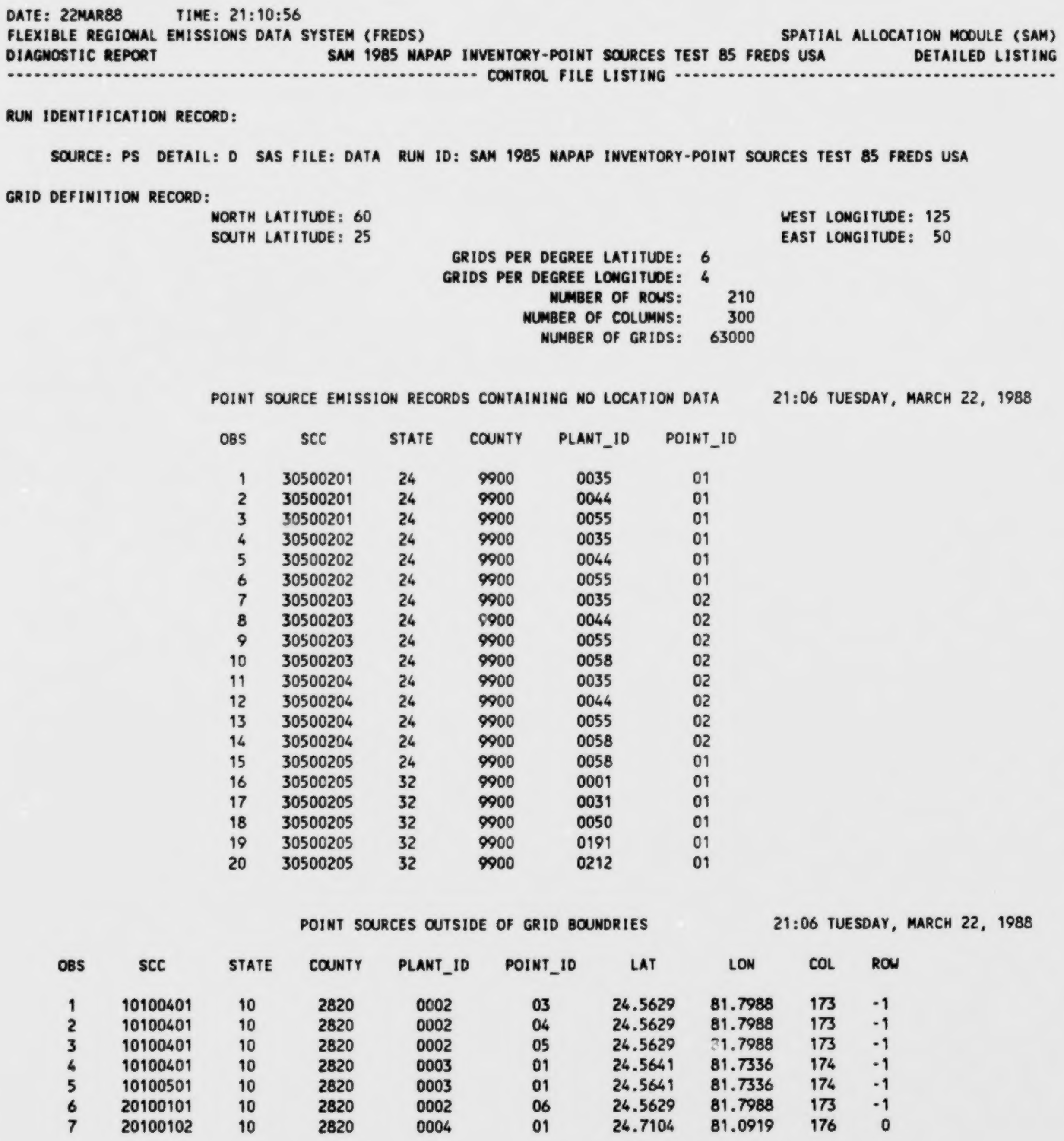
Each execution of SAM-PS writes two orphan data sets, one for emissions records with missing location data and another for points falling outside the NAPAP grid. The data contained in each of these files are in the same format as the input data set. Therefore, for 1985 NAPAP execution, the format of the orphan files is the same as the MDEM-PS output emissions file.

SAM Area Source Orphan File--

SAM-AS writes emissions records to an orphan file when no match is found in the SAFF. The file format is identical to the input emissions data. Therefore, for 1985 NAPAP area source processing, the I/O format for the SAM-AS orphan file is the same as the SM-AS output file.

SAM Diagnostic Report

The Spatial Allocation Module diagnostic report includes run date and time, a control options listing including the number of rows, columns, and grid cells, and the number of input records processed. If a detailed listing is requested by the user in the Control Options File, the output will include a listing of the location of every point source by grid cell address. For area sources, the spatially allocated emissions will be listed. Area source summary listings containing emission totals may also be requested. Processing and error messages are contained in all reports. Sample reports for point and area source processing using a subset of the 1985 NAPAP inventory are presented in Figures 4-12 and 4-13.



```
DATE: 22MAR88      TIME: 21:10:56
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)                                        SPATIAL ALLOCATION MODULE (SAM)
DIAGNOSTIC REPORT                  SAM 1985 NAPAP INVENTORY-POINT SOURCES TEST 85 FREDS USA            DETAILED LISTING
---------------------------------------------------- CONTROL FILE LISTING -----------------------------------------

RUN IDENTIFICATION RECORD:

    SOURCE: PS  DETAIL: D  SAS FILE: DATA  RUN ID: SAM 1985 NAPAP INVENTORY-POINT SOURCES TEST 85 FREDS USA

GRID DEFINITION RECORD:
                       NORTH LATITUDE: 60                                         WEST LONGITUDE: 125
                       SOUTH LATITUDE: 25                                         EAST LONGITUDE:  50
                                         GRIDS PER DEGREE LATITUDE:  6
                                        GRIDS PER DEGREE LONGITUDE:  4
                                                    NUMBER OF ROWS:    210
                                                 NUMBER OF COLUMNS:    300
                                                   NUMBER OF GRIDS:  63000


                       POINT SOURCE EMISSION RECORDS CONTAINING NO LOCATION DATA      21:06 TUESDAY, MARCH 22, 1988

                        OBS     SCC       STATE    COUNTY    PLANT_ID    POINT_ID

                          1   30500201     24       9900       0035         01
                          2   30500201     24       9900       0044         01
                          3   30500201     24       9900       0055         01
                          4   30500202     24       9900       0035         01
                          5   30500202     24       9900       0044         01
                          6   30500202     24       9900       0055         01
                          7   30500203     24       9900       0035         02
                          8   30500203     24       9900       0044         02
                          9   30500203     24       9900       0055         02
                         10   30500203     24       9900       0058         02
                         11   30500204     24       9900       0035         02
                         12   30500204     24       9900       0044         02
                         13   30500204     24       9900       0055         02
                         14   30500204     24       9900       0058         02
                         15   30500205     24       9900       0058         01
                         16   30500205     32       9900       0001         01
                         17   30500205     32       9900       0031         01
                         18   30500205     32       9900       0050         01
                         19   30500205     32       9900       0191         01
                         20   30500205     32       9900       0212         01


                              POINT SOURCES OUTSIDE OF GRID BOUNDRIES           21:06 TUESDAY, MARCH 22, 1988

   OBS      SCC      STATE    COUNTY    PLANT_ID    POINT_ID      LAT        LON       COL    ROW

    1    10100401     10       2820       0002         03       24.5629    81.7988    173     -1
    2    10100401     10       2820       0002         04       24.5629    81.7988    173     -1
    3    10100401     10       2820       0002         05       24.5629    81.7988    173     -1
    4    10100401     10       2820       0003         01       24.5641    81.7336    174     -1
    5    10100501     10       2820       0003         01       24.5641    81.7336    174     -1
    6    20100101     10       2820       0002         06       24.5629    81.7988    173     -1
    7    20100102     10       2820       0004         01       24.7104    81.0919    176      0
```

Figure 4-12. SAM sample "detailed" diagnositc report - point sources.

```
                        GRID LOCATIONS OF EMISSION RECORDS            21:06 TUESDAY, MARCH 22, 1988

   SCC        STATE    COUNTY    PLANT_ID    POINT_ID     LAT          LON     COL    ROW

 10100101      07       0265       0195         03       41.1715      73.185   208     98
 10100101      39       4700       0054         01       39.8268      76.331   195     89
 10100101      39       5220       0014         01       41.2015      76.071   196     98
 10100101      39       8320       0002         01       40.8380      76.825   193     96
 10100101      39       8320       0002         02       40.8380      76.825   193     96
 10100101      39       8320       0002         03       40.8380      76.825   193     96
 10100101      39       8320       0002         04       40.8380      76.825   193     96
 10100101      45       0810       0005         11       33.2562      94.071   124     50
 10100101      49       1100       0010         10       46.7555     122.857     9    131
 10100101      49       1100       0010         15       46.7555     122.857     9    131
 10100101      49       1100       0010         30       46.7555     122.857     9    131
 10100101      49       1100       0010         35       46.7555     122.857     9    131
 10100102      39       2180       0028         04       40.0565      77.523   190     91
 10100102      39       4700       0054         02       39.8268      76.331   195     89
 10100201      01       1200       0002         02       34.0132      85.973   157     55
 10100201      01       1600       0001         01       32.6017      87.782   149     46
 10100201      01       1600       0001         02       32.6017      87.782   149     46
 10100201      01       1980       0011         01       33.6333      87.060   152     52
 10100201      01       1980       0011         02       33.6333      87.060   152     52
 10100201      01       2400       1001         01       31.0088      87.999   149     37
 10100201      10       1800       0040         05       27.9069      82.422   171     18
```

Figure 4-12 (continued)

```
DATE: 23MAR88      TIME: 19:12:10
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)                                          SPATIAL ALLOCATION MODULE (SAM)
DIAGNOSTIC REPORT                 SAM 1985 NAPAP INVENTORY-AREA SOURCES TEST 85 FREDS USA              DETAILED LISTING

---------------------------------------------------- CONTROL FILE LISTING ---------------------------------------------
RUN IDENTIFICATION RECORD:
    SOURCE: AS  DETAIL: D  SAS FILE: DATA  RUN ID: SAM 1985 NAPAP INVENTORY-AREA SOURCES TEST 85 FREDS USA

GRID DEFINITION RECORD:

                  NORTH LATITUDE: 60                                            WEST LONGITUDE: 125
                  SOUTH LATITUDE: 25                                            EAST LONGITUDE:  50
                                        GRIDS PER DEGREE LATITUDE:  6
                                        GRIDS PER DEGREE LONGITUDE:  4
                                                 NUMBER OF ROWS:      210
                                              NUMBER OF COLUMNS:      300
                                                NUMBER OF GRIDS:    63000
SUBFILE DEFINITION RECORD:
     LAST RECORD:     6600000
    FIRST RECORD:           1
    -------------------------
    TOTAL RECORDS:    6600000

 POLLUTANT DEFINITION RECORD
    VARIABLE LIST: ASO2 ATSP ACO ANH3 SE35-SE49
                   SO2 TSP CO NH3 SESA35-SESA49


                                        SPATIALLY ALLOCATED EMISSIONS        17:21 WEDNESDAY, MARCH 23, 1988

                                            VARIABLE           SUM

                                            SO2         1947117.0609
                                            TSP        33996161.7617
                                            CO         55245189.0329
                                            NH3          213890.0000
                                            SESA35       153009.8162
                                            SESA36       193478.7192
                                            SESA37       474226.4311
                                            SESA38          196.1513
                                            SESA39           28.0715
                                            SESA40          379.8869
                                            SESA41        35408.5456
                                            SESA42         1867.0854
                                            SESA43        38457.2554
                                            SESA44         1754.8863
                                            SESA45          980.2154
                                            SESA46         4216.9608
                                            SESA47     13122702.7756
                                            SESA48      8402567.3195
                                            SESA49      4122772.4571

                              EMISSIONS RECORDS WITH NO SPATIAL ALLOCATION FACTORS    17:21 WEDNESDAY, MARCH 23, 1988

OBS   STATE   COUNTY        SCC       ASO2       ATSP        ACO      ANH3        SE35         SE36

  1     48     0710    00000001         0          0          0        .     0.0000895    0.0001438
  2     48     2060    00000001         1          0          2        .     0.0003635    0.0005839
  3     48     2660    00000001         1          0          4        .     0.0008201    0.0013174
  4     48     0080    00000002         1          0          3        .     0.0003366    0.0006251
  5     48     0710    00000002         3          1          8        .     0.0010113    0.0018782
  6     48     2060    00000002        12          5         29        .     0.0035978    0.0066816
  7     48     2440    00000002         1          1          4        .     0.0004419    0.0008340
  8     48     2660    00000002        31         12         74        .     0.0092206    0.0171239
  9     50     0020    00000002         3          4         22        .     0.0027544    0.0051153
 10     48     0080    00000003         4          0          1        .     0.0006709    0.0011376
```

Figure 4-13. SAM sample "detailed" diagnostic report - area sources.

```
OBS        SE37        SE38         SE39        SF40      SE41        SE42      SE43

  1    0.000348   0.0000000   0.00000000   0.0000000    0.0002   0.0002674    0.0007
  2    0.001414   0.0000000   0.00000000   0.0000000    0.0008   0.0010859    0.0027
  3    0.003190   0.0000000   0.00000000   0.0000000    0.0017   0.0024501    0.0062
  4    0.004809   0.0001697   0.00031520   0.0024246    0.0000   0.0000000    0.0000
  5    0.014448   0.0005099   0.00094700   0.0072846    0.0000   0.0000000    0.0000
  6    0.051397   0.0018140   0.00336890   0.0259146    0.0000   0.0000000    0.0000
  7    0.006415   0.0002264   0.00042050   0.0032346    0.0000   0.0000000    0.0000
  8    0.131722   0.0046490   0.00863390   0.0664146    0.0000   0.0000000    0.0000
  9    0.039349   0.0013888   0.00257915   0.0198396    0.0000   0.0000000    0.0000
 10    0.002917   0.0000000   0.00000000   0.0000000    0.0002   0.0003953    0.0010

OBS        SE44        SE45         SE46        SE47      SE48        SE49

  1    0.000000    0.000000     0.000000       0.014   0.01029     0.00000
  2    0.000000    0.000000     0.000000       0.058   0.04179     0.03383
  3    0.000000    0.000000     0.000000       0.130   0.09429     0.07633
  4    0.000002    0.000004     0.000031       0.031   0.03143     0.02694
  5    0.000007    0.000012     0.000094       0.094   0.09443     0.08094
  6    0.000024    0.000044     0.000336       0.336   0.33593     0.28794
  7    0.000003    0.000005     0.000042       0.042   0.04193     0.03594
  8    0.000060    0.000112     0.000861       0.861   0.86093     0.73794
  9    0.000018    0.000033     0.000257       0.257   0.25718     0.22044
 10    0.002914    0.004941     0.012670       0.083   0.07602     0.06516
```

```
GRID LOCATIONS OF EMISSION RECORDS (200 OBS)  17:21 WEDNESDAY, MARCH 23, 1988

   SCC      STATE   COUNTY   COL   ROW

00000001     07      0265    206    97
00000001     07      0265    206    98
00000001     07      0265    206    99
00000001     07      0265    206   100
00000001     07      0265    206   101
00000001     07      0265    207    97
00000001     07      0265    207    98
00000001     07      0265    207    99
00000001     07      0265    207   100
00000001     07      0265    207   101
00000001     07      0265    208    97
00000001     07      0265    208    98
00000001     07      0265    208    99
00000001     07      0425    208   101
00000001     07      0425    208   102
00000001     07      0425    208   103
00000001     07      0425    209   100
00000001     07      0425    209   101
00000001     07      0425    209   102
00000001     07      0425    209   103
```

Figure 4-13 (continued)

MODEL INPUT PREPROCESSOR

This section presents descriptions of the files associated with the MIP and the report generated by it. These files are as follows:

- MIP Control Options File
- Emissions Files or Subfiles
- SAS-EBCDIC Control Options File
- Modeler's Tapes (SAS and EBCDIC)
- MIP Diagnostic Report

MIP Control Options File

The MIP Control Options File is an EBCDIC file composed of three record types for area source processing: the Run Identification record, the Pollutant Variable List record, and the Resolution record. For point source processing, only the Run Identification record is required.

The Run Identification record contains the run identification header, the level of detail for the diagnostic report, the source type (AS or PS), and the number of subfiles being combined. The Pollutant List record contains the names of area source pollutant variables for output. The Resolution record instructs MIP to process gridded or nongridded area source emissions.

FILE NAME: MIP Control Options File

RECORD NAME: Run Identification Record - Point and Area Sources

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control File Record Type (-1)
3	3	1	I	INNUM	Number of Input Files to be Combined
5	5	1	A	DETAIL	Level of Detail for Diagnostic Report (='S', for area sources only, -'T')
7	8	2	A	SOURCE	Source Type ('AS' or 'PS')
10	71	62	A	RUN_ID	Run Identification Header

FILE NAME: MIP Control Options File RECORD NAME: Pollutant Variable List Record - Area Sources

Page 1 of 1

Record Position First	Last	Column Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control File Record Type (=2)
3	72	70	A	VARLIST	List of Pollutant Variables for Output[a]

FILE NAME: MIP Control Options File RECORD NAME: Resolution Record - Area Sources

Page 1 of 1

Record Position First	Last	Columen Width	Format	Variable Name	Description
1	1	1	I	TYPE	Control Options Record Type (=3)
3	12	10	A	EMRES	Level of Resolution of input emissions data (='gridded' or ='nongridded')[b]

---

[a] For 1985 NAPAP area source processing, the pollutant variable list is TOT1-TOT37 for the THC/NO_x Split file and TOT1-TOT20 for the TSP/SO_2 Split file. The pollutants corresponding to each TOT variable are prespecified by the user in earlier modules. The pollutants corresponding to the TOT variables for 1985 processing are defined with the MIP output file.

[b] Gridded refers to spatially allocated emissions (resolved by column and row). Nongridded refers to county level emissions (by SCC, State, County).

Emissions Files

The Model Input Preprocessor (MIP) can accept as input any SAS-formatted emissions file produced by the following FREDS system modules: Hydrocarbon Preprocessor (HCPREP), Model Data Extraction Module (MDEM), Temporal Allocation Module (TAM), Speciation Module (SM), and Spatial Allocation Module (SAM). The formats of the files produced by the above modules have been described in the Input/Output Format discussion of the respective modules and will not be repeated here. For point source processing as illustrated in Section 2, the input format corresponds to the speciation module output emissions file described earlier. For area source runs, the input format for MIP corresponds to the TAM output file.

SAS-EBCDIC Contol Options File

The SAS-EBCDIC Control Options File provides the SAS-to-EBCDIC (or ASCII) conversion program with the total number of species in the point source file. This defines the array for the number of pollutants to be written to EBCDIC. For area sources, the control file defines the number of pollutants and the level of resolution (COL, ROW, or SCC, STATE, COUNTY) of the emissions file to be written to EBCDIC.

Modeler's Tapes

The output from MIP is a Modeler's Tape containing speciated and spatially and temporally allocated emissions. MIP output differs significantly for point and area sources.

Point Source Modeler's Tape--

The point source Modeler's Tape contains annual emissions totals and spatial, temporal, and species allocation factors which can be multiplied together to produce gridded, speciated emissions for a typical weekday, Saturday, and Sunday in each season. Resolution of the point source Modeler's Tapes into speciated, hourly, gridded emissions requires multiplication of annual emissions by their respective factors. A sample SAS program to resolve point source emissions, the Point Source Resolution program (PSR), is supplied with the Detailed Program Description for the Model Input Preprocessor.

Area Source Modeler's Tapes--

Due to the large number of area source records, a separate Modeler's Tape is generated for each of the 12 temporal scenarios. In addition, due to the large number of speciated emissions, the area aource emissions are divided by pollutants: THC/NO_x and TSP/SO_2. Each tape contains 24 gridded or nongridded, hourly, speciated emissions totals for each source record. The SAS and EBCDIC (or ASCII) formats for these files follow. Note for county-level processing, the variables COL and ROW in the first eight fields will be replaced by SCC, STATE and COUNTY, which would occupy the first 14 fields.

FILE NAME: SAS-EBCDIC Control Options File

RECORD NAME: Point Source Record

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	3	3	A	NUMSPEC	The number of species classes requested.

FILE NAME: SAS-EBCDIC Control Options File

RECORD NAME: Area Source Record

Page 1 of 1

Record Position					
First	Last	Column Width	Format	Variable Name	Description
1	3	3	I	NUMPOLL	Number of Pollutants
5	14	10	A	EMRES	Resolution of emissions file (-'gridded' or -'nongridded')

FILE NAME: Point Source Modeler's Tapes, SAS, EBCDIC, and ASCII

RECORD NAME: Emissions Record

Page 1 of 6

Record Position[a]						
First	Last	Column Width[b]	SAS Length (Bytes)[c]	Format	Variable Name	Description
1	8	8	8	I	SCC	SCC Code[d]
9	10	2	8	I	STATE	AEROS State Code
11	14	4	8	I	COUNTY	AEROS County Code
15	18	4	4	A	PLANT_ID	Plant Identification Code
19	20	2	2	A	POINT_ID	Point Identification Code
21	23	3	8	I	AQCR	Air Quality Control Region
24	27	4	8	I	SIC	SIC Code
28	35	8	8	F 8.5	LAT	Fractional Latitude (degrees)
36	44	9	8	F 9.5	LON	Fractional Longitude (degrees)
45	48	4	8	I	COL	Grid Column
49	52	4	8	I	ROW	Grid Row
53	53	1	8	I	ZONE	Time Zone Flag[e]

---

[a] SAS files are variable defined, and thus, variables in SAS data sets are referenced by name. Record positions refer to the EBCDIC or ASCII Modeler's Tape.

[b] Column Width refers to the EBCDIC or ASCII File.

[c] SAS Length refers to the SAS formatted modeler's tape.

[e] A listing of point source SCC codes is given in Appendix H.

[e] For Time Zone Flag:
1 - Eastern Time Zone
2 - Central Time Zone
3 - Mountain Time Zone
4 - Pacific Time Zone

FILE NAME: Point Source Modeler's Tapes, SAS, and EBCDIC, and ASCII

RECORD NAME: Emissions Record

Page 2 of 6

Record Position						
First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
54	54	1	8	I	DAYLITE	Daylight Savings Flag[d]
55	61	7	8	F 7.0	FLOW	Exhaust Gas Flow Rate (ft^3/min)
62	65	4	8	F 4.0	PLUME_HT	Plume Height (ft)
66	69	4	8	F 4.1	STACK_DI	Stack Diameter (ft)
70	73	4	8	F 4.0	STACK_HT	Stack Height (ft)
74	77	4	8	F 4.0	STACK_TP	Stack Temperature (°F)
78	86	9	8	F 9.2	VELOCITY	Stack Gas Velocity (ft/sec)
87	92	6	8	F 6.4	HCHOWT	Aldehyde and Methane Speciation Adjustment (dimensionless weight fraction)
93	94	2	8	I	NUMPOLL	Number of Pollutants (maximum-15)
95		5	8	I	SAROAD1-15	Pollutant SAROAD Code
		8	8	F 8.1	EMISS1-15	Pollutant Emissions (tons/yr)

NOTE: SAROAD and EMISS will be repeated NUMPOLL (up to 15) times, once for each pollutant.

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
		2	8	I	NUM_DAY	Number of Temporal Factor Sets in Record

---

[d] 0 - No, Daylight Savings Time is not adhered to in this area.
- Yes, Daylight Savings Time is adhered to in this area.

FILE NAME: Point Source Modeler's Tapes, SAS, EBCDIC, and ASCII

RECORD NAME: Emissions Record

Page 3 of 6

Record Position						
First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
		5	8	F 5.3	SEA1-12	Seasonal Temporal Allocation Factor
		6	8	F 6.4	DAY1-12	Daily Temporal Allocation Factor
		6	8	F 6.4	HFGMT1[a]	Temporal Allocation Factor for Hour 1
		6	8	F 6.4	HFGMT2	Temporal Allocation Factor for Hour 2
		6	8	F 6.4	HFGMT3	Temporal Allocation Factor for Hour 3
		6	8	F 6.4	HFGMT4	Temporal Allocation Factor for Hour 4
		6	8	F 6.4	HFGMT5	Temporal Allocation Factor for Hour 5
		6	8	F 6.4	HFGMT6	Temporal Allocation Factor for Hour 6
		6	8	F 6.4	HFGMT7	Temporal Allocation Factor for Hour 7
		6	8	F 6.4	HFGMT8	Temporal Allocation Factor for Hour 8
		6	8	F 6.4	HFGMT9	Temporal Allocation Factor for Hour 9
		6	8	F 6.4	HFGMT10	Temporal Allocation Factor for Hour 10

---

[a] HFGMT1 is defined as 0000-0100 GMT.

FILE NAME: Point Source Modeler's Tapes, SAS, EBCDIC, and ASCII

RECORD NAME: Emissions Record

Page 4 of 6

Record Position						
First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
		6	8	F 6.4	HFGMT11	Temporal Allocation Factor for Hour 11
		6	8	F 6.4	HFGMT12	Temporal Allocation Factor for Hour 12
		6	8	F 6.4	HFGMT13	Temporal Allocation Factor for Hour 13
		6	8	F 6.4	HFGMT14	Temporal Allocation Factor for Hour 14
		6	8	F 6.4	HFGMT15	Temporal Allocation Factor for Hour 15
		6	8	F 6.4	HFGMT16	Temporal Allocation Factor for Hour 16
		6	8	F 6.4	HFGMT17	Temporal Allocation Factor for Hour 17
		6	8	F 6.4	HFGMT18	Temporal Allocation Factor for Hour 18
		6	8	F 6.4	HFGMT19	Temporal Allocation Factor for Hour 19
		6	8	F 6.4	HFGMT20	Temporal Allocation Factor for Hour 20
		6	8	F 6.4	HFGMT21	Temporal Allocation Factor for Hour 21
		6	8	F 6.4	HFGMT22	Temporal Allocation Factor for Hour 22
		6	8	F 6.4	HFGMT23	Temporal Allocation Factor for Hour 23

FILE NAME: Point Source Modeler's Tapes, SAS, EBCDIC, and ASCII

RECORD NAME: Emissions Record

Page 5 of 6

Record Position						
First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
		6	8	F 6.4	HFGMT24	Temporal Allocation Factor for Hour 24

NOTE: HFGMT1 to HFGMT24 may be repeated 12 times, once for each temporal scenario. The variable HFGMT may range from HFGMT1 to HFGMT288, where HFGMT is in GMT.

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
		3	8	I	NUMSP	Number of Speciation Factors
		5	8	I	CAT1-49	Major Pollutant SAROAD of Species
		7	8	I	CLASS1-49	SAROAD Code of Pollutant Species
		11	8	E 11.4	SF1-49	Speciation Factor of Species[f]

NOTE: CAT, CLASS and SF are repeated once for each species, or 49 times for the 1985 NAPAP inventory.

---

[f] Units for speciation factors are moles/kg or dimensionless weight fractions. Units for specific sub-species are provided with the SFF and PSPLIT file formats.

FILE NAME: Point Source Modeler's Tapes, SAS, EBCDIC, and ASCII

RECORD NAME: Emissions Record

Page 6 of 6

Record Position

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
		4	8	F 4.1	CONEFF1-15	Control Efficiency of Point Pollutant (%)
		1	8	I	ESTMET1-15	Estimation Method Used for Point Pollutant[9]

NOTE: CONEFF and ESTMET will be repeated NUMPOLL (up to 15) times, once for each pollutant.

NOTE: An additional variable is included in the SAS formatted output tapes:

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
			8	I	SAF	Spatial Allocation Fraction (=1 for point sources)

---

[9] A listing of point source estimation methods is given in Appendix H.

FILE NAME: Area Source Modeler's Tapes, SAS, EBCDIC, and ASCII - THC/NO_x Split File

RECORD NAME: Emissions Record

Page 1 of 4

Record Position						
First	Last	Column Width[b]	SAS Length (Bytes)[c]	Format	Variable Name	Description
1	4	4	8	I	COL	Grid Column
5	8	4	8	I	ROW	Grid Row
9	10	2	8	I	GMT	Hour (Greenwich Mean Time)
11	20	10	8	E 10	TOT1	Resolved NO_x Emissions (tons/hr)
21	30	10	8	E 10	TOT2	Resolved VOC Emissions (tons/hr)
31	40	10	8	E 10	TOT3	Resolved THC Emissions (tons/hr)
41	50	10	8	E 10	TOT4	Resolved Methane Emissions (moles/hr)
51	60	10	8	E 10	TOT5	Resolved Ethane Emissions (moles/hr)
61	70	10	8	E 10	TOT6	Resolved Propane Emissions (moles/hr)
71	80	10	8	E 10	TOT7	Resolved Alkane (reactivity 1) Emissions (moles/hr)
81	90	10	8	E 10	TOT8	Resolved Alkane (reactivity 2) Emissions (moles/hr)

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name. Record positions refer to the EBCDIC or ASCII Modeler's Tape.

[b] Column Width refers to the EBCDIC or ASCII file.

[c] SAS Length refers to the SAS formatted Modeler's Tape.

FILE NAME: Area Source Modeler's Tapes, SAS, EBCDIC, and ASCII - THC/NO_x Split File

RECORD NAME: Emissions Record

Page 2 of 4

Record Position

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
91	100	10	8	E 10	TOT9	Resolved Alkane (reactivity 3) Emissions (moles/hr)
101	110	10	8	E 10	TOT10	Resolved Alkane (reactivity 4) Emissions (moles/hr)
111	120	10	8	E 10	TOT11	Resolved Alkane/Aromatic Mix Emissions (moles/hr)
121	130	10	8	E 10	TOT12	Resolved Ethene Emissions (moles/hr)
131	140	10	8	E 10	TOT13	Resolved Propene Emissions (moles/hr)
141	150	10	8	E 10	TOT14	Resolved Primary Alkene Emissions (moles/hr)
151	160	10	8	E 10	TOT15	Resolved Internal Alkene Emissions (moles/hr)
161	170	10	8	E 10	TOT16	Resolved Primary/ Internal Mix Alkene Emissions (moles/hr)
171	180	10	8	E 10	TOT17	Resolved Benzene/ Halobenzene Emissions (moles/hr)
181	190	10	8	E 10	TOT18	Resolved Aromatic (reactivity 1) Emissions (moles/hr)
191	200	10	8	E 10	TOT19	Resolved Aromatic (reactivity 2) Emissions (moles/hr)

FILE NAME: Area Source Modeler's Tapes, SAS, EBCDIC, and ASCII - THC/NO_x Split File

RECORD NAME: Emissions Record

Page 3 of 4

Record Position						
First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
201	210	10	8	E 10	TOT20	Resolved Phenol/Cresols Emissions (moles/hr)
211	220	10	8	E 10	TOT21	Resolved Styrenes Emissions (moles/hr)
221	230	10	8	E 10	TOT22	Resolved Formaldehyde Emissions (moles/hr)
231	240	10	8	E 10	TOT23	Resolved Higher Aldehyde Emissions (moles/hr)
241	250	10	8	E 10	TOT24	Resolved Acetone Emissions (moles/hr)
251	260	10	8	E 10	TOT25	Resolved Higher Ketones Emissions (moles/hr)
261	270	10	8	E 10	TOT26	Resolved Organic Acids Emissions (moles/hr)
271	280	10	8	E 10	TOT27	Resolved Acetylene Emissions (moles/hr)
281	290	10	8	E 10	TOT28	Resolved Haloalkenes Emissions (moles/hr)
291	300	10	8	E 10	TOT29	Resolved Unreactive Hydrocarbon Emissions (moles/hr)
301	310	10	8	E 10	TOT30	Resolved Other Hydrocarbon (reactivity 1) Emissions (moles/hr)
311	320	10	8	E 10	TOT31	Resolved Other Hydrocarbon (reactivity 2) Emissions (moles/hr)

FILE NAME: Area Source Modeler's Tapes, SAS, EBCDIC, and ASCII - THC/NO_x Split File

RECORD NAME: Emissions Record

Page 4 of 4

Record Position

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
321	330	10	8	E 10	TOT32	Resolved Other Hydrocarbon (reactivity 3) Emissions (moles/hr)
331	340	10	8	E 10	TOT33	Resolved Other Hydrocarbon (reactivity 4) Emissions (moles/hr)
341	350	10	8	E 10	TOT34	Resolved Unidentified Hydrocarbons Emissions (moles/hr)
351	360	10	8	E 10	TOT35	Resolved Unassigned Hydrocarbon Emissions (moles/hr)
361	370	10	8	E 10	TOT36	Resolved Emissions for NO (tons/hr)
371	380	10	8	E 10	TOT37	Resolved Emissions for NO_2 (tons/hr)

FILE NAME: Area Source Modeler's Tapes, SAS[a], EBCDIC, and ASCII - TSP/SO_2 Split File

RECORD NAME: Emissions Record

Page 1 of 3

Record Position

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
1	4	4	8	I	COL	Grid Column
5	8	4	8	I	ROW	Grid Row
9	10	2	8	I	GMT	Hour (Greenwich Mean Time)
11	20	10	8	E 10	TOT1	Resolved Emissions for SO_2 (tons/hr)
21	30	10	8	E 10	TOT2	Resolved Emissions for SO_4 (tons/hr)
31	40	10	8	E 10	TOT3	Resolved Emissions for TSP (tons/hr)
61	70	10	8	E 10	TOT4	Resolved Emissions for CO (tons/hr)
71	80	10	8	E 10	TOT5	Resolved Emissions for NH_3 (moles/hr)
81	90	10	8	E 10	TOT6	Resolved Emissions for Calcium, 0-2.5 um (tons/yr)
91	100	10	8	E 10	TOT7	Resolved Emissions for Calcium, 2.5-10 um (tons/yr)

---

[a] SAS files are variable defined and, thus, variables in SAS data sets are referenced by name. Record positions refer to the EBCDIC or ASCII Modeler's Tape.

[b] Column Width refers to the EBCDIC or ASCII file

[c] SAS Length refers to the SAS formatted Modeler's Tape.

FILE NAME: Area Source Modeler's Tapes, SAS[a], EBCDIC, and ASCII - TSP/SO_2 Split File

RECORD NAME: Emissions Record

Page 2 of 3

Record Position

First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
101	110	10	8	E 10	TOT8	Resolved Emissions for Calcium, Total Particulate (tons/hr)
111	120	10	8	E 10	TOT9	Resolved Emissions for Magnesium, 0-2.5 um (tons/hr)
121	130	10	8	E 10	TOT10	Resolved Emissions for Magnesium, 2.5-10 um (tons/hr)
131	140	10	8	E 10	TOT11	Resolved Emissions for Magnesium, Total Particulate (tons/hr)
141	150	10	8	E 10	TOT12	Resolved Emissions for Potassium, 0-2.5 um (tons/hr)
151	160	10	8	E 10	TOT13	Resolved Emissions for Potassium, 2.5-10 um (tons/hr)
161	170	10	8	E 10	TOT14	Resolved Emissions for Potassium, Total Particulate (tons/hr)
171	180	10	8	E 10	TOT15	Resolved Emissions for Sodium, 0-2.5 um (tons/hr)
181	190	10	8	E 10	TOT16	Resolved Emissions for Sodium, 2.5-10 um (tons/hr)

FILE NAME: Area Source Modeler's Tapes, SAS[a], EBCDIC, and ASCII - TSP/SO_2 Split File

RECORD NAME: Emissions Record

Page 3 of 3

Record Position First	Last	Column Width	SAS Length (Bytes)	Format	Variable Name	Description
191	200	10	8	E 10	TOT17	Resolved Emissions for Sodium, Total Particulate (tons/hr)
201	210	10	8	E 10	TOT18	Resolved Emissions for Total Particulates, 0-2.5 um (tons/hr)
211	220	10	8	E 10	TOT19	Resolved Emissions for Total Particulates, 2.5-6 um (tons/hr)
221	230	10	8	E 10	TOT20	Resolved Emissions for Total Particulates, 6-10 um (tons/hr)

MIP Diagnostic Report

The diagnostic report consists of the JES2 job log and the SAS job log, including the number of observations and variables in each file processed. If the totals report is requested, the MIP will print the hourly totals for area source emissions. A sample of the diagnostic report containing hourly area source totals is given in Figure 4-14. A point source diagnostic report is not generated by MIP.

```
                                                     HOURLY EMISSIONS                    18:10 WEDNESDAY, JUNE 8, 1988

GMT    TOT1   TOT2   TOT3    TOT4      TOT5       TOT6      TOT7     TOT8      TOT9     TOT10     TOT11    TOT12

  1    1195   1375   1604   22518   1019577   12971080    818251   386812   2018595   2556048   1014680   160674
  2    1008   1172   1389   22518    899190   12283737    752532   379676   1721127   2140787    853901   134643
  3     854   1022   1227   22518    799173   11587503    681835   378907   1501404   1816241    746589   112624
  4     750    900   1095   22518    694678   10978722    634345   377388   1284063   1572407    647193   104019
  5     632    777    966   22518    588767   10721158    599847   379282   1060897   1329964    545250    92263
  6     516    660    839   22518    488967   10098208    552573   379344    851272   1106991    450307    78952
  7     454    585    758   22518    429751    9784947    526828   379621    724296    964359    389525    72602
  8     415    542    725   22518    391502   10348292    539414   383520    639314    870617    348880    67082
  9     418    540    724   22518    386135   10394684    540039   383912    631684    861529    345478    67723
 10     515    655    849   22518    450858   10935625    576198   396357    799679   1110409    445523    76950
 11     850   1032   1352   22518    679534   18126095    725956   421794   1373063   1861049    707634   115365
 12    1431   1568   2051   22518    989518   27328172    972829   446944   2182383   2885536   1074600   197949
 13    1841   1793   2311   22518   1099569   29308871   1074264   453674   2522923   3377597   1232850   262448
 14    1941   1867   2487   22518   1110199   35045839   1144678   472302   2606772   3557288   1245104   284853
 15    2034   1932   2555   22518   1140361   35277709   1177232   472143   2685411   3719022   1286063   300677
 16    2058   1934   2557   22518   1140425   35212988   1179837   471717   2699273   3743844   1285077   304664
 17    1977   1909   2528   22518   1131473   35015297   1175407   470949   2627193   3714215   1259722   288845
 18    1984   1916   2534   22518   1137453   34997233   1176435   470674   2643662   3729340   1266008   291366
 19    2062   1965   2587   22518   1167950   35148313   1189809   470486   2742674   3824306   1305912   301931
 20    2116   2052   2679   22518   1230356   35497173   1217750   470188   2874951   3983667   1374507   306300
 21    2237   2204   2842   22518   1330485   36062588   1263412   469563   3124928   4261303   1496381   324193
 22    2137   2203   2728   22518   1363774   29669816   1239584   446265   3109214   4314451   1518592   312917
 23    1855   1982   2372   22518   1268897   22047500   1140585   422477   2750085   3946995   1379734   267227
 24    1535   1692   2043   22518   1148522   19866967    978290   418373   2406176   3232855   1220874   219650

GMT    TOT13    TOT14    TOT15    TOT16     TOT17     TOT18  TOT19     TOT20     TOT21    TOT22   TOT23    TOT24

  1   556757  1061054   841842   452721   2713685   1262885   7010    856794    659677   139276   55371    47359
  2   496241   874822   678443   381335   2356171   1031056   7010    730434    574043   128463   51358    45815
  3   446070   737261   570892   324789   2121053    851145   7010    627330    501892   119906   48399    44283
  4   405090   623515   479719   273113   1946437    760730   7010    520400    468068   112240   46276    43775
  5   368654   499193   376976   218722   1827048    681910   7010    409834    415042   101696   42147    42128
  6   328048   390773   290675   169455   1664802    607329   7010    307400    367812    93642   39578    41462
  7   302114   309940   219409   136874   1578978    561879   7010    245789    342590    88635   37896    40991
  8   301060   258949   175548   115675   1622124    536657   7010    204406    321650    84671   36326    40426
  9   301099   254675   172769   113316   1632916    536362   7010    199303    326645    85178   36882    40793
 10   333149   339056   245948   148047   1945153    708264   7010    265928    355089    89442   37937    40920
 11   457566   677113   526905   280820   2499281   1185347   7723    504869    479431   124054   44670   195229
 12   654211  1173356   946525   468116   3310653   1776270   8735    827486    712156   168430   51612   363400
 13   723965  1343798  1071478   535275   3721327   2106351   8940    942446    885497   180341   53927   392642
 14   752091  1354988  1050742   542999   3908170   2372536   9330    953837    952398   192158   56241   533887
 15   771399  1410559  1089335   564470   4004770   2489249   9339    987285    994992   194541   56786   535489
 16   769482  1400627  1072525   563567   4017259   2516989   9339    989308   1006880   195064   57156   535698
 17   760891  1390150  1060859   559375   3947314   2519359   9339    979210    969473   195056   57155   535698
 18   761887  1393805  1062252   561808   3954059   2525415   9339    985359    975955   195403   57230   535698
 19   777066  1439109  1103163   579438   4018743   2556772   9330   1017594   1002696   196821   57585   535693
 20   807974  1543118  1201175   617521   4100019   2603589   9330   1082606   1017614   200901   58477   535687
 21   860184  1713804  1362945   679316   4265696   2688656   9330   1187260   1064596   207011   59813   535620
```

Figure 4-14. MIP sample "totals" diagnostic report - area sources.

SECTION 5

CONTROL STATEMENTS

Execution of the modules comprising the FREDS system is accomplished by a series of control statements written in Job Control Language (JCL). These statements introduce the job to the operating system, provide accounting information, direct the operating system on the program(s) to be executed, request hardware devices, allocate work space and temporary data sets, and provide input/output (I/O) information for the job. Application of these control statements to the execution of the FREDS system requires a working knowledge of JCL by the user.

The control statements used in FREDS are of three types: Job Statements, Execution Statements, and Data Definition Statements. Briefly, the Job Statement marks the beginning of the job, the Execution Statement names the program or procedure to be executed, and Data Definition (DD) Statements describe each data set and request allocation of I/O devices. In this section, JCL will be supplied for each module with user supplied modifications appearing in lower case letters. Typical specifications for these parameters are found within this section under "User Supplied JCL" and in the Environment section of this report. Files referenced with a disposition of SHR are assumed to be catalogued in the NCC-IBM system. This is accomplished by specifying CATLG as a DISP parameter when creating a new data set.

In order to quantify sort work space requirements, the user may print statistics from the IBM utility SYNCSORT as part of the job log. This can be accomplished by adding the options "SORTLIST" and "SORTMSG" to the JCL execution statement (e.g. EXEC SAS) for any FREDS module, and by adding the following lines of JCL code:

```
//SORTPARM DD  *
  LIST
  BMSG
  MSG
  MSGDD=SYSOUT
/*
//SYSOUT   DD SYSOUT=A
```

Sort statistics will appear at the end of the job log for each EXEC statement when this code is added along with the EXEC statement options.

HYDROCARBON PREPROCESSOR

Control Statements

Execution of HCPREP is controlled by a series of statements written in IBM Job Control Language (JCL). In order to execute HCPREP, the user must supply the following information:

- Time requirement for execution
- File names for DD labels as follows:

COF	Control Options File
MASTER	Annual Emissions Input File
WTPCT	Weight Percent-Profile File
SCCPROF	SCC-Profile File
ORPHAN	Diagnostic/QA Output Files
OUTFILE	Annual Emissions Output File
SORTED,OUTTEMP	Temporary Storage
SYSIN	HCPREP SAS Source Code

- Space requirements for output files and temporary storage

The execution deck for HCPREP processing is shown below. Uppercase statements are typed as shown; lowercase text indicates information to be provided by the user.

```
1.  //jobname JOB (account#,account information),name,NOTIFY=userid,
    //  TIME=(minutes,seconds)

2.  /*ROUTE PRINT HOLD

3.  //HPM EXEC SAS,OPTIONS=MACRO

4.  //SYSIN DD DSN=hcprep sas program name,DISP=SHR

5.  //COF DD DSN=control options file name,DISP=SHR

6.  //MASTER DD DSN=annual emissions file name,DISP=SHR

7.  //WTPCT DD DSN=weight percent-profile file name,DISP=SHR

8.  //SCCPROF DD DSN=scc-profile file name,DISP=SHR
```

```
9.  //ORPHAN DD DSN-orphan file name,DISP-(NEW,CATLG,DELETE),
    //  UNIT-disk or tape

10. //OUTFILE DD DSN-output annual emissions file name,
    //  DISP-(NEW,CATLG,DELETE),UNIT-disk or tape

11. //SORTED DD DSN-&&TEMP,UNIT-disk or tape

12. //OUTTEMP DD DSN-&&TEMP,UNIT-disk or tape
```

User Supplied JCL--

Line 1.	For "jobname", enter three-character user ID and job name (up to five characters), account information, and the time requirement for job execution.
Lines 4 and 5.	The names of the HCPREP source code and control options files must be specified by the user.
Line 6.	Enter the point or area source emissions file name.
Lines 7 and 8.	Enter the names of the weight percent and SCC profile files.
Lines 9 and 10.	Replace "orphan file name" and "output annual emissions file name" with the output file names for each data set. Either disk or tape data sets may be specified, depending on the file sizes being processed. For the orphan file, disk space should be sufficient, as this file is usually small. The appropriate space or label parameters must also be specified, depending on the unit type requested.
Line 11.	The temporary data set may be disk or tape and will vary as a function of data set size. The appropriate parameters for the unit type must be specified by the user.
Line 12.	OUTTEMP is a temporary file used by HCPREP to store the emissions file prior to the hydrocarbon adjustment. Because of its size, it should be assigned the same unit type as OUTFILE.

QUALITY CONTROL MODULE

Control Statements

Quality Control Module execution is controlled by statements written in IBM System 370 Job Control Language (JCL). Execution of QCM requires the following user supplied information:

- Time requirement for execution
- Input file names for DD labels as follows:

SYSIN	Quality Control Module SAS Code
COF	Quality Control Module Control Options File
ALLONEP	Point Source FREDS Input File
ALLONEA	Area Source FREDS Input File
ALLHCPP	Point Source Hydrocarbon Preprocessor Output
ALLHCPA	Area Source Hydrocarbon Preprocessor Output
ALLMDMP	Point Source Model Data Extraction Module Output
ALLMDMA1	Area Source Model Data Extraction Module THC/NO_x Output
ALLMDMA2	Area Source Model Data Extraction Module TSP/SO_2 Output
ALLSPMP	Point Source Speciation Module Output
ALLSPMA1	Area Source Speciation Module THC/NO_x Output
ALLSPMA2	Area Source Speciation Module TSP/SO_2 Output
ALLSAMP	Point Source Spatial Allocation Module Output
THCSAMA1	Area Source Spatial Allocation Module THC/NO_x Output #1
THCSAMA2	Area Source Spatial Allocation Module THC/NO_x Output #2
THCSAMA3	Area Source Spatial Allocation Module THC/NO_x Output #3
THCSAMA4	Area Source Spatial Allocation Module THC/NO_x Output #4
TSPSAMA1	Area Source Spatial Allocation Module TSP/SO_2 Output #1
TSPSAMA2	Area Source Spatial Allocation Module TSP/SO_2 Output #2
TSPSAMA3	Area Source Spatial Allocation Module TSP/SO_2 Output #3
TSPSAMA4	Area Source Spatial Allocation Module TSP/SO_2 Output #4
ALLTAMP	Point Source Temporal Allocation Module Output
THCTAM1	Area Source Temporal Allocation Module THC/NO_x Output #1
THCTAM2	Area Source Temporal Allocation Module THC/NO_x Output #2
.	. . . . . .
.	. . . . . .
THCTAM24	Area Source Temporal Allocation Module THC/NO_x Output #24
TSPTAM1	Area Source Temporal Allocation Module TSP/SO_2 Output #1
TSPTAM2	Area Source Temporal Allocation Module TSP/SO_2 Output #2
.	. . . . . .
.	. . . . . .
TSPTAM24	Area Source Temporal Allocation Module TSP/SO_x Output #24

THCTAM1	Canadian Area Source Temporal Allocation Module THC/NO_x Output #1
THCTAM2	Canadian Area Source Temporal Allocation Module THC/NO_x Output #2
.	. . . . . .
.	. . . . . .
THCTAM24	Canadian Area Source Temporal Allocation Module THC/NO_x Output #24
TSPTAM1	Canadian Area Source Temporal Allocation Module TSP/SO_2 Output #1
TSPTAM2	Canadian Area Source Temporal Allocation Module TSP/SO_2 Output #2
.	. . . . . .
.	. . . . . .
TSPTAM24	Canadian Area Source Temporal Allocation Module TSP/SO_2 Output #24
ALLMIPP	Point Source Model Input Preprocessor Output
THCMIP1	Area Source Model Input Preprocessor THC/NO_x Output #1
THCMIP2	Area Source Model Input Preprocessor THC/NO_x Output #2
.	. . . . . .
.	. . . . . .
THCMIP24	Area Source Model Input Preprocessor THC/NO_x Output #24
TSPMIP1	Area Source Model Input Preprocessor TSP/SO_2 Output #1
TSPMIP2	Area Source Model Input Preprocessor TSP/SO_2 Output #2
.	. . . . . .
.	. . . . . .
TSPMIP12	Area Source Model Input Preprocessor TSP/SO_2 Output #12
ALLTOTP	Point Source Baseline or Intermediate National Emissions Total File[a]
ALLTOTA	Area Source Baseline or Intermediate National Emissions Total File[a]
STATOTP	Point Source Baseline or Intermediate State Emissions Total File[a]
STATOTA	Area Source Baseline or Intermediate State Emissions Total File[a]
SCCTOTP	Point Source Baseline or Intermediate SCC Emissions Total File[a]
SCCTOTA	Area Source Baseline or Intermediate SCC Emissions Total File[a]
ALLUSAP	U.S. Point Source Baseline or Intermediate National Emissions Total File for input to step MIP
ALLUSAA	U.S. Area Source Baseline or Intermediate National Emissions Total File for input to step MIP
ALLCANP	Canadian Point Source Baseline or Intermediate National Emissions Total File for step MIP
ALLCANA	Canadian Area Source Baseline or Intermediate National Emissions Total File for step MIP
STAUSAP	U.S. Point Source Baseline or Intermediate State Emissions Total File for step MIP
STACANP	Canadian Point Source Baseline or Intermediate State Emissions Total File for step MIP

SCCUSAP	U.S. Point Source Baseline or Intermediate SCC Emissions Total File for step MIP
SCCCANP	Canadian Point Source Baseline or Intermediate SCC Emissions Total File for step MIP

- Output file names for DD labels as follows:

QAALL	Intermediate National Emissions Total File[b]
QASTA	Intermediate State Emissions Total File[b]
QASCC	Intermediate SCC Emissions Total File[b]
REPORT1	National Emissions Totals Diagnostic Report
REPORT2	State Emissions Totals Diagnostic Report
REPORT3	SCC Emissions Totals Diagnostic Report
REPORT4	(Reserved for future use)
REPORT5	Temporal Allocation Factor Emissions Total Diagnostic Report

Emissions total files which are output from QCM may also be used as QCM input files for QA comparisons.

Following is an example of the execution deck for the Quality Control Module. Uppercase text should be entered as shown; lowercase text is variable and must be supplied by the user.

```
1.   //jobname JOB (account#,account information),name,NOTIFY=userid,
     // TIME=(minutes,seconds)
2.   /*ROUTE PRINT HOLD
3.   //QASUMS EXEC SAS,OPTIONS=MACRO
4.   //SYSIN DD DSN=quality control module SAS file,DISP=SHR
5.   //COF DD DSN=quality control module control options file,DISP=SHR
6.   //dd label DD DSN=emissions file,DISP=SHR
```

User Supplied JCL--

Line 1. Enter information required for a standard job card.

Lines 4 and 5. Enter the QCM source code and control options file names.

Line 6. Replace "dd label" and "emissions file" with the appropriate emissions file dd label and data set name.

---

[a] File may also be used as a QCM output file.
[b] File may also be used as a QCM input file.

MODEL DATA EXTRACTION MODULE

Control Statements--Point Sources

For point source execution of MDEM, the following user supplied information is required:

- Time requirement for execution
- File names for DD labels as follows:

COF	Control Options File
TEMP	Temporary Storage
EMIS	Preprocessed SAS Formatted Emissions File (input)
MAJMISC	Point Source Emissions File (output)
MINMISC	Emissions File-Subsetted Sources (output - optional)
MAJTEMP	Intermediate Emissions
SYSIN	MDEM SAS Source Code

- Space requirements for output file(s) and temporary storage.

The execution deck for MDEM processing of point sources is presented below.

```
 1.  //jobname JOB (account#,account information),name,NOTIFY=userid,
     // TIME=(minutes,seconds)

 2.  /*ROUTE PRINT HOLD

 3.  //MDEM EXEC SAS,OPTIONS='NODYNALLOC MACRO',SORT=xxx

 4.  //MAJTEMP DD DSN=&&TEMP1,UNIT=disk or tape,DISP=(NEW,PASS)

 5.  //SYSIN DD DSN=MDEM program name,DISP=SHR

 6.  //COF DD DSN=control options file name,DISP=SHR

 7.  //MAJMISC DD DSN=output point source emissions file, DISP=(NEW,CATLG,DELETE),
     // UNIT=disk or tape

 8.  //MINMISC DD DSN=emissions file-subsetted sources,DISP=(NEW,CATLG,DELETE),
     // UNIT=disk or tape

 9.  //EMIS DD DSN=preprocessed SAS formatted annual point source file,DISP=SHR
```

User Supplied JCL--

Line 1.	Enter information for standard job card, including the three character user ID and up to five character user-defined job name (jobname), user account number, other accounting information, user identification, and the time requirement for job execution.
Line 3.	'NODYNALLOC' and SORT-xxx may be omitted or vary for different data sets. See a SAS manual for more information on these SAS options.
Line 4.	The temporary data set may be disk or tape and will vary as a function of data set size. The appropriate parameters for the unit type must be specified by the user.
Lines 5 and 6.	The names of the MDEM point source SAS code and control files must be specified by the user.
Line 7.	Replace "output point source emissions file" with output file name. If point sources are not to be divided into more than one file, this will be the only output file for this run. Either a disk or tape data set may be specified, depending on the file size being processed. The appropriate space or label parameters must also be specified, depending on the unit type requested.
Line 8.	Replace "emissions file-subsetted sources" with an output data set name. If point sources are not separated, this line is omitted. Unit requirements follow the same rules as line 7.
Line 9.	Replace "preprocessed SAS formatted annual point source file" with the user-defined data set name.

Control Statements--Area Sources

For area sources, the following user supplied information is necessary:

- Time requirement for execution
- File names for the following DD labels:

COF	Control Options File
TEMP	Temporary Storage
EMIS	Preprocessed SAS Formatted Emissions File (input)
MAJMISC	Area Source Emissions File (output)
SYSIN	MDEM SAS Source Code
MAJMISC	Area Source Emissions File (undivided) (output)
MAJMISC1	Area Source THC/NO_x Emissions File (output)
MAJMISC2	Area Source TSP/SO_2 Emissions File (output)

- Space requirements for output file(s) and temporary storage.

The execution deck for MDEM processing of area sources is presented below.

```
 1.  //jobname JOB (account#,account information),name,NOTIFY=userid,
     // TIME=(minutes,seconds)

 2.  /*ROUTE PRINT HOLD

 3.  //MDEM EXEC SAS,OPTIONS='NODYNALLOC MACRO',SORT=xxx

 4.  //TEMP DD DSN=&&TEMP1,UNIT=disk or tape

 5.  //SYSIN DD DSN=MDEM program name,DISP=SHR

 6.  //COF DD DSN=control options file name,DISP=SHR

 7.  //MAJMISC DD DSN=area source emissions file,DISP=(NEW,CATLG,DELETE),
     // UNIT=disk or tape

 8.  //MAJMISC1 DD DSN=area source THC/NOx emissions file,
     // DISP=(NEW,CATLG,DELETE), UNIT=disk or tape

 9.  //MAJMISC2 DD DSN=area source TSP/SO2 emissions file,
     // DISP=(NEW,CATLG,DELETE), UNIT=disk or tape

10.  //EMIS DD DSN=preprocessed SAS formatted area source file,DISP=SHR
```

User Supplied JCL--

Line 1.	Enter standard job card information.
Line 3.	'NODYNALLOC' and SORT=xxx may be omitted or vary as a function of file size. Refer to a SAS manual for more information on these SAS options.
Line 4.	The unit type will vary with file size.
Lines 5 and 6.	The MDEM area source SAS code and corresponding control options file must be specified by the user.
Line 7.	Enter output area source emissions file name, unit type and appropriate parameters as a function of file size. This file contains all input pollutants.
Line 8.	Enter THC/NO_x output area source emissions file name, unit type and appropriate parameters as a function of file size.
Line 9.	Enter TSP/SO_2 output area source emissions file name, unit type and appropriate parameters as a function of file size.
Line 10.	Enter the preprocessed SAS formatted area source file data set name.

TEMPORAL ALLOCATION MODULE

Control Statements--Point Sources

To execute the TAM for point sources, the following user supplied information is required:

- Time requirement for execution
- File names for DD labels as follows:

COF	Control Options File
WORK	Temporary Work Space
TEMP	Temporary Storage
TEMP1-TEMP5	Temporary Data Storage
INFILE	Input Emissions File
TZF	Time Zone File
TAFF	Temporal Allocation Factor File
OUTFILE	Temporally Allocated Emissions File (output)
SYSIN	TAM SAS Source Code
ORPHAN	Orphaned Emissions Records

- Space requirements

The execution deck for TAM processing of point sources is presented below.

```
 1.  //jobname JOB (account#,account information),name,NOTIFY=USERID,
     // TIME=(minutes,seconds)

 2.  /*ROUTE PRINT HOLD

 3.  //TAM EXEC SAS,OPTIONS=MACRO

 4.  //SYSIN DD DSN=TAM program name,DISP=SHR

 5.  //COF DD DSN=control options file name,DISP=SHR

 6.  //WORK DD UNIT=SYSDA,SPACE=(ppp,sss)

 7.  //TEMP DD DSN=&&TEMP,DISP=(NEW,PASS),UNIT=disk or tape

 8.  //TEMP1 DD DSN=&&TEMP1,DISP=(NEW,PASS),UNIT=disk or tape

 9.  //TEMP2 DD DSN=&&TEMP2,DISP=(NEW,PASS),UNIT=disk or tape

10.  //TEMP3 DD DSN=&&TEMP3,DISP=(NEW,PASS),UNIT=disk or tape

11.  //TEMP4 DD DSN=&&TEMP4,DISP=(NEW,PASS),UNIT=disk or tape
```

```
12.  //TEMP5 DD DSN=&&TEMP5,DISP=(NEW,PASS),UNIT=disk or tape

13.  //INFILE DD DSN=emissions file data set name,DISP=SHR

14.  //OUTFILE DD DSN=temporally allocated emissions file name,
     // DISP=(NEW,CATLG,DELETE),UNIT=disk or tape

15.  //TZF DD DSN=time zone file name,DISP=SHR

16.  //TAFF DD DSN=temporal allocation factor file name,DISP=SHR

17.  //ORPHAN DD DSN=orphaned emissions file name, DISP=SHR
```

User Supplied JCL--

Line 1.	Enter information for standard job card.
Lines 4 and 5.	Enter user supplied TAM SAS source code and control options file names.
Line 6.	Enter required direct access primary (ppp) and secondary (sss) work space.
Lines 7-12.	These lines represent temporary storage disk space or tapes. Size requirements of the storage space may vary as a function of the files being processed. The user should determine temporary space requirements and appropriate parameters for each case.
Line 13.	Enter the emissions file input data set name.
Line 14.	Enter temporally allocated output data set name, unit type and parameters.
Lines 15 and 16.	Enter the names of time zone and temporal allocation factor files.
Line 17.	Enter the file name for emissions records with no time zone data. Enter the unit type and corresponding parameters.

Control Statements--Area Sources

The Temporal Allocation Module for area sources is comprised of four sequential programs or job steps. The first processes the data for temporal allocation similar to the point source module. The second step utilizes the IBM utility SYNCSORT to sort emissions by column and row or SCC, State, and County. Once the sort is complete, a FORTRAN routine multiplies emissions by their temporal allocation factors. The fourth and final step is a SAS program to convert the EBCDIC output back to SAS format. The user input for execution is as follows:

- Time requirement for execution
- File names for DD labels as follows:

COF	Control Options File (TAM.SAS, MTPREP.FORT, MTPREP.SAS)
TEMP	Temporary Storage
SORTIN	Temporary TAM EBCDIC Output, SYNCSORT Input
SORTOUT	Temporary Sort Output File
TAMIN	Input Emissions File
INFILE	MTPREP.SAS Input File (FORTOUT)
TAFF	Temporal Allocation Factor File
STATE	State Specific Allocations, Temporary File
SCC	SCC Specific Allocations, Temporary File
JOBLIB	MTPREP.FORT Load Library
FT10F001	MTPREP.FORT Control Options File
FT11F001	MTPREP.FORT Input (SORTOUT)
FT20F001	MTPREP EBCDIC Output (FORTOUT)
OUTFILE	MTPREP.SAS SAS Formatted Output (temporally resolved emissions file)
SYSIN	TAM or MTPREP.SAS Source Code

- Space requirements for execution and output of TAM, SYNCSORT, MTPREP.FORT, and MTPREP.SAS.

The execution deck for sequential TAM processing of area sources is presented below.

1. //jobname JOB (account#,account information),name,NOTIFY=userid,
   // TIME=(minutes,seconds)

2. /*ROUTE PRINT HOLD

3. //JOBLIB DD DSN=partitioned data set name containing MTPREP.FORT load
   // module,DISP=SHR

4. //TAM EXEC SAS,OPTIONS=MACRO

5. //SYSIN DD DSN=TAM program file name,DISP=SHR

6. //COF DD DSN=TAM control options file name,DISP=SHR

7. //TEMP DD DSN=&&TEMP,DISP=(NEW,PASS),UNIT=disk or tape

8. //SORTIN DD DSN=&&SORTIN,UNIT=disk or tape, DISP=(NEW,PASS),
   // DCB=parameters

9. //STATE DD DSN=&&TEMP2,UNIT=disk or tape

10. //SCC DD DSN=&&TEMP3,UNIT=disk or tape

```
11.  //TAMIN DD DSN-emissions file data set name,DISP-SHR

12.  //TAFF DD DSN-temporal allocation factor file name,DISP-SHR

13.  /*

14.  //*SORT TAM OUTPUT FILE (SORTIN)

15.  //SORT EXEC PGM-SYNCSORT,PARM-'SIZE(MAX),FLAG(I),LIST'

16.  //SYSOUT DD SYSOUT-A

17.  //SORTIN DD DSN-&&SORTIN,DISP-(OLD,DELETE,KEEP)

18.  //SORTOUT DD DSN-&&SORTOUT,DISP-(NEW,PASS),UNIT-disk or tape

19.  //SORTWKnn DD UNIT-disk

20.  //SYSIN DD SORT FIELDS-See "User supplied JCL",FORMAT-CH,FILSZ-Exxxx

21.  /*

22.  //*EXECUTE MTPREP.FORT

23.  //FORT EXEC PGM-MTPREP

24.  //FT06F001 DD SYSOUT-A

25.  //FT10F001 DD DSN-control options file name,DISP-SHR

26.  //FT11F001 DD DSN-&&SORTOUT,DISP-(OLD,DELETE,KEEP)

27.  //FT20F001 DD DSN-&&FORTOUT,DISP-(NEW,PASS),UNIT-disk or tape,
     // DCB-parameters

28.  /*

29.  //* EXECUTE MTPREP.SAS

30.  //SAS EXEC SAS,OPTIONS-MACRO

31.  //SYSIN DD DSN-program file name,DISP-SHR

32.  //COF DD DSN-control options file name

33.  //INFILE DD DSN-&&FORTOUT,DISP-(OLD,DELETE,KEEP)

34.  //OUTFILE DD DSN-temporally resolved emissions file,UNIT-tape or disk,
     // DISP-(NEW,CATLG,DELETE)
```

User Supplied JCL--

Line 1.	Enter information for standard job card.
Line 3.	Enter the name of the partitioned data set containing the MTPREP.FORT load module.
Lines 5 and 6.	Enter the TAM area source SAS code and corresponding control file names.
Lines 7-10.	These are temporary data sets. Since the space allotted to them may vary with file size, the unit type and associated parameters must be input by the user. NOTE: SORTIN is the TAM output data set and is passed on to the next step for further processing. DCB parameters must be calculated for SORTIN as follows: RECFM=FB,LRECL=240+PARMS+NPOLL*10 and BLKSIZE=LRECL*20. The constant 240 is a function of 24 hours/day, NPOLL is the total number of pollutants, and PARMS is equal to 8 for gridded emissions (COL,ROW) and 14 for county level emissions files (SCC, STATE, COUNTY).
Line 11.	Enter emissions file input data set name.
Line 12.	Enter the name of the temporal allocation factor file to be used for processing.
Line 15.	Parameters specified with SYNCSORT control space and output. For further information on SYNCSORT options refer to the online documentation 'JUSD.SYNCSORT.DATA'
Line 19.	This line is required for disk sorts unless DYNALLOC, MERGE, or in-core sort are used. Substitute sort work area number in place of nn. Enter appropriate parameters for disk space. For tape sort units, use the SORTLIB DD label. Note: more than one sort work area may be specified.
Line 20.	The sort fields to be specified will be different for gridded and county-level emissions. The general format is to specify the position of the first character of the first sort field, the width of the sort field, and whether it is to be sorted ascending or descending. This is repeated for each additional sort field. For gridded emissions files, SORT FIELDS = (1,4,A,5,4,A). In this case, the first sort field (Column) begins with the first character, has a width of four and is sorted in ascending order. The second sort field (Row) begins with the fifth character, has a width of four, and is also sorted in ascending order. To sort county-level emissions by SCC, State, County, the sort fields specified are: (1,8,A,9,2,A,11,4,A). The format parameter specifies the character type (CH=EBCDIC), and the FILSZ is an estimate of the number of records to be sorted. The sort fields will always either reflect Column and Row, or SCC State and County. FILSZ will vary from file to file.

Line 24.	SYSOUT-A may be replaced with any other printer unit available (e.g., SYSOUT-L for the laser printer).
Lines 25 and 32.	Enter the name of the user-supplied Control Options File for program execution. The same COF is used for MTPREP.FORT and MTPREP.SAS.
Line 27.	The unit and corresponding parameters must be specified for the output data set. DCB parameters for SORTOUT must be specified as follows: RECFM-FB,LRECL-VAR+10*NPOLL and BLKSIZE-LRECL*20. VAR is equal to 10 for gridded emissions (to account for the variables COL, ROW, and GMT, of lengths 4,4 and 2, respectively) and 16 for county level (to account for the variables SCC, STATE, COUNTY and GMT, of lengths 8,2,4, and 2, respectively); NPOLL is the total number of pollutants.
Line 31.	Enter the SAS source code file name containing the program MTPREP.SAS.
Line 34.	Enter the user-defined name of the output data set and the unit to which it is to be written. The appropriate unit parameters must also be specified.

SPECIATION MODULE

Control Statements--Point Sources

The following user supplied information is required for the execution of the Speciation Module (SM) for point sources:

- Time requirement for execution
- File names for DD labels as follows:

COF	Control Options File
INFILE	Input Emissions File
SFF	Speciation Factor File (Particulates)
PSPLIT	PSPLIT File (input)
OUTFILE1	Speciated Emissions File (output)
OUTFILE2	SM Orphaned Emissions File
SYSIN	SM SAS Source Code

- Space requirements

The execution deck for SM processing of point sources is presented below.

```
 1.  //jobname JOB (account#,account information),name,NOTIFY=userid,
     // TIME=(minutes,seconds)

 2.  /*ROUTE PRINT HOLD

 3.  //SM EXEC SAS,OPTIONS=MACRO

 4.  //SYSIN DD DSN=SM program file name,DISP=SHR

 5.  //COF DD DSN=control options file name,DISP=SHR

 6.  //INFILE DD DSN=emissions file data set name,DISP=SHR

 7.  //OUTFILE1 DD DSN=speciated emissions file data set name,
     // DISP=(NEW,CATLG,DELETE),UNIT=disk or tape

 8.  //OUTFILE2 DD DSN=SM orphaned emissions file name,DISP=(NEW,CATLG,DELETE),
     // UNIT=disk or tape

 9.  //SFF DD DSN=speciation factor file name,DISP=SHR

10.  //PSPLIT DD DSN=PSPLIT file name,DISP=SHR
```

User Supplied JCL--

Line 1. Enter information for standard job card.

Line 4. Enter the file name containing the SM source code.

Line 5. Enter the file name of the user-supplied Control Options File.

Line 6. Enter input data set name.

Line 7. Enter output data set name for speciated emissions file. Specify the unit type and space or label parameters.

Line 8. Enter output data set name for emission records with no speciation profiles. Specify output unit type and corresponding parameters.

Line 9. Enter the name of the speciation factor file to be used for processing.

Line 10. Enter the name of the PSPLIT file to be used for processing.

Control Statements--Area Sources

Speciation Module processing of area sources requires the following user supplied information:

- Time requirement for execution.
- File names for DD labels as follows:

COF	Control Options File
WORK	Temporary Work Space
INFILE	Input Emissions File
SFF	Speciation Factor File (Particulates)
PSPLIT	PSPLIT File (input)
SAROAD	Pollutant Class Description File
TZF	Time Zone File
SMOUT	Speciated Emissions File (output)
ORPHAN	SM Orphaned Emissions File (output)
SYSIN	SM SAS Source Code

- Space requirements

The execution deck for SM processing of area sources is provided below.

```
1. //jobname JOB (account#,account information),name,NOTIFY=userid,
   // TIME=(minutes,seconds)

2. /*ROUTE PRINT HOLD

3. //SM EXEC SAS,OPTIONS=MACRO

4. //SYSIN DD DSN=SM program file name,DISP=SHR
```

```
 5.  //TZF DD DSN-time zone file name,DISP-SHR

 6.  //WORK DD UNIT-disk or tape

 7.  //COF DD DSN-control options file name,DISP-SHR

 8.  //INFILE DD DSN-emissions file library data set name,DISP-SHR

 9.  //SMOUT DD DSN-speciated emissions file name,DISP-(NEW,CATLG,DELETE),
     // UNIT-disk or tape

10.  //ORPHAN DD DSN-SM orphaned data set name,DISP-(NEW,CATLG,DELETE),
     // UNIT-disk or tape

11.  //SFF DD DSN-speciation factor file name, DISP-SHR

12.  //PSPLIT DD DSN-PSPLIT file name,DISP-SHR

13.  //SAROAD DD DSN-pollutant class description file name,DISP-SHR
```

User Supplied JCL--

Line 1.	Enter information for standard job card.
Line 4.	Enter the file name containing the SM SAS source code.
Line 5.	Enter the name of the file containing the time zone data.
Line 6.	The unit type and parameters will vary with file size. For larger data sets, a tape may be necessary. For smaller data sets, disk space may be allocated.
Line 7.	Enter a user supplied Control Options File name for SM execution.
Line 8.	Enter input data set name (area source emissions file).
Line 9.	Enter output data set name. Enter unit type and space or label parameters.
Line 10.	Enter orphaned output data set name for emissions records with no speciation profiles. Specify the unit type and parameters for the orphaned data set.
Line 11.	Enter the name of the speciation factor file to be used for processing. If the SFF is not to be used, enter 'SFF DD DUMMY'.
Line 12.	Input the PSPLIT file name to be used for processing. If the PSPLIT file is not to be used, enter 'PSPLIT DD DUMMY'.
Line 13.	Enter the file name of the pollutant class description file.

SPATIAL ALLOCATION MODULE

Control Statements--Point Sources

To execute SAM for point sources, the following user supplied information is necessary:

- Time requirement for execution
- File names for the following DD labels:

COF	Control Options File
INFILE	Input Emissions File
OUTFILE1	Spatially Allocated Emissions File (output)
OUTFILE2	SAM Orphaned Emissions File(s)
SYSIN	SAM SAS Source Code

- Space requirements for output and module execution.

The execution deck for SAM processing of point sources is presented below.

```
 1.  //jobname JOB (account#,account information),name,NOTIFY=userid,
     // TIME=(minutes,seconds)

 2.  /*ROUTE PRINT HOLD

 3.  //SAM EXEC SAS,OPTIONS=MACRO

 4.  //SYSIN DD DSN=SAM program file name,DISP=SHR

 5.  //COF DD DSN=SAM control options file name,DISP=SHR

 6.  //INFILE DD DSN=emissions file data set name,DISP=SHR

 7.  //OUTFILE1 DD DSN=spatially allocated emissions file,
     // DISP=(NEW,CATLG,DELETE),UNIT=disk or tape

 8.  //OUTFILE2 DD DSN=orphaned emissions file name(s),DISP=(NEW,CATLG,DELETE),
     // UNIT=disk or tape
```

User Supplied JCL--

Line 1.	Enter information for standard job card.
Line 4.	Enter the SAM SAS source code file name.
Line 5.	Enter the name of the user supplied control options file.
Line 6.	Enter input data set name.

Line 7. Enter spatially allocated output data set name. Enter the unit type (disk or tape) and necessary JCL parameters.

Line 8. Enter name of orphaned emissions data set and allocate the unit type and parameters.

Control Statements--Area Sources

Spatial allocation of area sources requires the following user supplied information:

- Time required for execution
- File names for the following DD labels:

COF	Control Options File
SAMIN	Input Emissions File
SAFF	EBCDIC Spatial Allocation Factor File (input)
SAFFIN	Spatial Allocation Factor File (SAS format; temporary)
SAFFOUT	SAFF (subsetted and sorted)
SAMOUT	Spatially Allocated Emissions (output)
SYSIN	SAM SAS Source Code
ORPHAN	SAM "orphaned" Emissions File (output)

- Space requirements for output and module execution.

The execution deck for SAM processing of area sources is presented below.

```
1.  //jobname JOB (account#,account information),name,NOTIFY=userid,
    // TIME=(minutes,seconds)

2.  /*ROUTE PRINT HOLD

3.  //SAM EXEC SAS,OPTIONS=MACRO

4.  //SYSIN DD DSN=SAM program file name,DISP=SHR

5.  //COF DD DSN=SAM control options file name,DISP=SHR

6.  //SAMIN DD DSN=input emissions data set,DISP=SHR

7.  //SAFF DD DSN=spatial allocation factor file name,DISP=SHR

8.  //SAFFIN DD DSN=&&TEMP,UNIT=disk,SPACE=(TRK,(pppp,sss))

9.  //SAFFOUT DD DSN=&&SORT,UNIT=disk,SPACE=(TRK,(pppp,sss))
```

10. //SAMOUT DD DSN-spatially allocated emissions data set,
    // DISP-(NEW,CATLG,DELETE),UNIT-disk or tape

11. //ORPHAN DD DSN-Orphaned emissions records, DISP-(NEW,CATLG,DELETE),
    // UNIT-disk or tape

User Supplied JCL--

Line 1.	Enter standard job card.
Line 4.	Enter SAM SAS source code file name.
Line 5.	Input user supplied SAM control options file name for execution of the module.
Line 6.	Input emissions file to be spatially allocated.
Line 7.	Enter the name of the spatial allocation factor file to be used for SAM processing.
Lines 8 and 9.	The unit type may change as a function of the files being processed, however, in most cases disk space should be sufficient. The number of primary (pppp) and secondary (sss) tracks must be specified by the user.
Lines 10. and 11.	The unit type and SPACE or LABEL parameters must also be specified by the user.

MODEL INPUT PREPROCESSOR

Control Statements--Point Sources

The Model Input Processor creates SAS-formatted modeler's tapes by combining a user-specified number of input files (for example, U.S. and Canadian point source emissions files). In addition, an EBCDIC or ASCII file may be created independently or by adding an additional job step. To create a modeler's tape, the following user supplied inputs are necessary:

- Time requirement for execution
- File names for DD labels as follows:

COF	Control Options File
IN1	Emissions File #1 (e.g., U.S. point sources)
IN2	Emissions File #2 (e.g., Canadian point sources)
INn	Emissions File #n
MIPIN	Temporary Storage
MIPOUT	SAS Modeler's Tape (output)
SYSIN	MIP SAS Source Code

- Space requirements for execution and output.

The MIP execution deck for point source processing is presented below.

```
 1.  //jobname JOB (account#,account information),name,NOTIFY=userid,
     // TIME=(minutes,seconds)

 2.  /*ROUTE PRINT HOLD

 3.  //MIP EXEC SAS,OPTIONS='MACRO NODYNALLOC',SORT=xxx

 4.  //IN1 DD DSN=point source emissions file#1, DISP=SHR

 5.  //IN2 DD DSN=point source emissions file#2, DISP=SHR

 6.  //INn DD DSN=point source file#n,DISP=SHR

 7.  //MIPIN DD DSN=&&TEMP,UNIT=disk or tape

 8.  //MIPOUT DD DSN=output data set name,DISP=(NEW,CATLG,DELETE),
     // UNIT=disk or tape

 9.  //COF DD DSN=MIP control options file name,DISP=SHR

10.  //SYSIN DD DSN=MIP program file name,DISP=SHR
```

User Supplied JCL--

Line 1. Enter information for standard job card.

Line 3. 'NODYNALLOC' and SORT=xxx may vary or be omitted for different data sets. Refer to a SAS manual for more information on these SAS options.

Lines 4-6. Enter point source input data set names.

Line 8. Enter output data set name, unit type and associated JCL parameters (e.g., SPACE or LABEL).

Line 9. Enter the name of the user supplied control options file for MIP execution.

To convert point source MIP output from SAS format to EBCDIC or ASCII characters, the following information is required:

- File names for DD labels as follows:

  INFILE - SAS Modeler's Tape (MIPOUT)
  FILE1 - EBCDIC or ASCII Modeler's Tape (Output)
  SYSIN - SAS Source Code for SAS to EBCDIC (or ASCII) Conversion
  COF - Control Options File

The execution deck for the conversion as an additional to MIP job step is as follows:

```
11.  /*

12.  //EBCDIC EXEC SAS,OPTIONS=MACRO

13.  //INFILE DD DSN=SAS formatted MIP output file,DISP=SHR

14.  //FILE1 DD DSN=output EBCDIC modeler's tape data set name,
     // DISP=(NEW,CATLG,DELETE),UNIT=disk or tape,DCB=parameters

15.  //SYSIN DD DSN=SAS source code,DISP=SHR

16.  //COF DD DSN=EBCDIC conversion control options file,DISP=SHR
```

User supplied JCL--

User supplied JCL is described below. If the conversion is executed as a separate program, two additional job cards are required -- 1 and 2 as given in the MIP execution deck.

Line 13. Enter the MIP output data set name from line number 8 (above).

Line 14. Enter the EBCDIC or ASCII modeler's tape output data set name. The unit and corresponding parameters must be specified for the output data set. DCB parameters for FILE1 must be specified as follows: RECFM-FB, LRECL-3266 for a speciated (i.e. 49 species), temporally (i.e. 12 temporal scenarios), and spatially resolved modeler's tape, and BLKSIZE-LRECL*20 (note: the user may also define a multiplier other than 20 for determination of blocksize). If an ASCII file is desired, an additional parameter, OPTCD-Q, must be added to the DCB parameters.

Line 15. The SAS source code file name should be entered here. If desired, the user may specify SYSIN DD * and incorporate the source code with the JCL. This is particularly useful if this step is to be executed separately from MIP.

Line 16. Enter the user-supplied SAS-EBCDIC control options file name.

<u>Control Statements--Area Sources</u>

The processing of area sources through the FREDS system is segmented due to the large size of the file containing all United States and Canadian area sources and the large number of speciated pollutants. For the 1985 NAPAP Emissions Inventory, the U.S. and Canadian area source data were processed separately. The MIP runstream for area sources therefore consists of two parts: (1) combining and processing U.S. and Canadian data sets to produce a SAS modeler's tape; and (2) a SAS to EBCDIC or SAS to ASCII conversion step. The user input necessary to create the SAS modeler's tape is:

- Time requirement for execution
- File names for DD labels as follows:

COF	Control Options File
IN1,IN2	Area Source Emissions Files (input)
MIPIN	Temporary Data Storage
MIPOUT	SAS Modeler's Tape (output data set)
MIPBACK	Backup Output Data Set (temporary SAS format)
SYSIN	SAS Source Code for MIP

The MIP execution deck for area source processing is presented below:

```
 1. //jobname JOB (account#,account information),name,NOTIFY-userid,
    // TIME-(minutes,seconds)

 2. /*ROUTE PRINT HOLD

 3. //MIP EXEC SAS,OPTIONS-'MACRO NODYNALLOC',SORT-xxx

 4. //IN1 DD DSN-US area source file,DISP-SHR
 5.  //IN2 DD DSN=Canadian area source file,DISP=SHR

 6.  //MIPIN DD DSN=&&TEMP,UNIT=disk or tape

 7.  //MIPOUT DD DSN=modeler's tape output SAS data set, DISP=(NEW,CATLG,DELETE),
     // UNIT=disk or tape

 8.  //MIPBACK DD DSN=&&TEMP,UNIT=disk or tape

 9.  //COF DD DSN=MIP control options file name,DISP=SHR

10.  //SYSIN DD DSN=MIP source code file name,DISP=SHR

11.  /*
```

User Supplied JCL--

Line 1.	Enter standard job card information.
Line 3	'NODYNALLOC' and SORT=xxx may vary and may be omitted for different data sets. Refer to a SAS manual for further information on these options.
Lines 4 and 5.	Enter U.S. and Canadian area source emissions file data set names.
Line 6.	For large area source emissions files, a tape unit will be necessary. Otherwise, disk space may be adequate.
Line 7.	Enter intermediate output data set name, unit type, and necessary JCL parameters for the specified unit (e.g., SPACE or LABEL parameters).
Line 9.	Enter the file name for user supplied control options.

To produce an EBCDIC or ASCII area source modeler's tape from the SAS formatted MIP output, the following information is required:

- File names for DD labels as follows:

INFILE	- SAS Modeler's Tape (MIPOUT)
FILE1	- EBCDIC or ASCII Area Source Modeler's Tape.
SYSIN	- SAS Source Code for SAS to EBCDIC (or ASCII) conversion
COF	- Control Options File

The execution deck for the SAS-to-EBCDIC or SAS-to-ASCII conversion as an additional MIP job step is as follows:

```
30.  /*

31.  //EBCDIC EXEC SAS,OPTIONS-MACRO

32.  //INFILE DD DSN-SAS formatted MIP output file,DISP-SHR

33.  //FILE1 DD DSN-output EBCDIC or ASCII modeler's tape,
     //DISP-(NEW,CATLG,DELETE), UNIT-disk or tape, DCB-parameters

34.  //SYSIN DD DSN-SAS source code,DISP-SHR

35.  //COF DD DSN-SAS-EBCDIC control options file,DISP-SHR
```

User Supplied JCL--

User supplied JCL is described below. If the conversion is executed as a separate program, two additional job cards are required -- 1 and 2 as given with the MIP execution deck.

Line 32. Enter the MIP output data set name from line number 26 (above).

Line 33. Enter the EBCDIC or ASCII output data set name. The unit and corresponding parameters must be specified by the user. DCB parameters for FILE1 are specified as follows: RECFM-FB, LRECL-VAR+10*NPOLL, and BLKSIZE-LRECL*20. VAR is equal to 10 for gridded emissions (to account for the variables COL, ROW, and GMT of lengths 4,4 and 2, respectively) and 16 for county-level (to account for the variables SCC, STATE, COUNTY, and GMT, of lengths 8,2,4 and 2, respectively); NPOLL is the total number of pollutants. For an ASCII file, the parameter OPTCD-Q must be specified in the DCB-statement.

Line 35. Enter the SAS source code file name. If desired, the user may specify SYSIN DD * and incorporate the source code with the JCL. This may be useful as a separate execution or add-on to MIP, as the SAS code is brief.

Line 36. Enter the file name for the user-supplied control options file.

SECTION 6

OPERATING INSTRUCTIONS

Operating instructions for FREDS are discussed in four subsections: (1) User Supplied Data, (2) Error Messages, (3) Summary Statistics, and (4) User Warnings/Considerations.

USER SUPPLIED DATA

For execution of the FREDS system, the user must provide the following:

1. Standard job cards for each module
2. EXEC and DD cards for each module
3. Control Options File (COF) for each module
4. SAS Source Code for each module
5. Emissions File data set names for each module
6. Preprocessed SAS formatted Emissions Files (point and area sources)
7. Point or Area Source SCC-Profile file (for HCPREP)
8. Weight Percent-Profile File (for HCPREP)
9. MTPREP.FORT load module (for area source TAM)
10. Time Zone File
11. Temporal Allocation Factor Files
12. Speciation Factor File
13. PSPLIT File (for SM)
14. Pollutant Description File (for area source SM)
15. Spatial Allocation Factor File (for area source SAM)

ERROR MESSAGES

Error handling in the FREDS modules consists of warning messages (the user is notified of the occurrences, but program execution continues) and error messages (execution is terminated). Errors are usually associated with user selected options in the COF. Errors should not be found in the preprocessed point or area source SAS files, as these data have been extensively checked prior to input to FREDS.

Hydrocarbon Preprocessor

Warning Messages--

While no warning messages are written into the SAS source code, SAS will generate and display warnings in the IBM job log for entries which do not adhere to certain basic criteria (e.g., arithmetic operations performed on missing data values). These should be examined by the user, in addition to the HCPREP diagnostic report output, to determine whether the program has properly executed. In particular, it should be noted that adjustment factors equal to unity will cause division-by-zero errors which will appear in program output.

Error Messages--

Error messages are produced by HCPREP if invalid options are specified in the Control Options File. The following will produce errors, causing termination of the program:

1. If the source type specified is not area (AS) or point source (PS);
2. If the SAROAD Code for the variable HC_CODE is not equal to 43101 or 43104;
3. If the diagnostic report option is not detailed (D) or summary (S).

Quality Control Module

No error or warning messages relating to execution are supplied by the SAS program code. The SAS processor will generate summary messages relating to execution of the SAS code. These messages should be inspected by the user along with the summary statistics presented in the IBM JCL job log.

Model Data Extraction Module

Warning Messages--

The MDEM point and area source programs issue warning messages when variables in the emissions file do not meet certain criteria. If this condition is encountered, MDEM prints a warning message in the job output and continues execution. These warnings are:

1. If invalid operating data, i.e., if day=0 or hour=0, are encountered in the point source file, a warning message is issued with the State, County, Plant, Point, and SCC for which the invalid data were encountered, along with the record's emissions.
2. If SCC=0 for a point source record, a warning message for invalid SCC code is issued along with the State, County, Plant and Point of occurrence.

Error Messages--

Fatal error messages are issued and program execution ceases if any of the following occurs in the Control Options File:

1. More than one Run Identification (type 1) record is encountered (point and area sources);
2. File type on the Run Identification record does not specify point or area source;
3. Diagnostic report option (type 1 record) does not indicate detailed (D) or summary (S) options for point sources, or detailed, summary, or totals (T) for area sources;
4. More than 24 SIC/SCC combinations are requested for point sources and more than 49 categories are requested for area sources on the SIC/SCC definition record (type 2);
5. For point sources only, the number of emissions limits for major-minor source separation exceeds 15 on type 3 record;
6. For area sources only, if the number of annual pollutants to be extracted is less than 1 or greater than 15 (type 3 control record);
7. For area sources only, the record type for the Pollutant Identification record is not represented by a blank or missing value symbol;
8. Control record types which are not otherwise specified by 1, 2, or 3 for point or area sources.

Temporal Allocation Module

Warning Messages--

1. Seasonal throughputs for point sources are totaled and checked. If THRU_TOT is not equal to 100, the throughputs are normalized to 100 by the following formula:

   Seasonal Factor = (seasonal throughput)/(total annual throughput).

   When this occurs, a warning message is printed along with the SCC, State, County, Plant, and Point of occurrence. The program then resumes normal execution.

Error Messages--

If invalid data are found in the Control Options Files of the main TAM module, MTPREP.FORT, or MTPREP.SAS (the subroutines correspond to area sources only), execution ceases. The following control options data errors include:

1. The occurence of more than one Run Identification (type 1) record (point and area sources);

2. A source type on the Run Identification record not designated as area (AS) or point source (PS);

3. The diagnostic report option (type 1 record) not specified as detailed (D) or summary (S) (point and area sources);

4. For area sources only, an invalid daylight savings time option specified on a type 1 record, i.e., if DAYLITE $\neq$ Y and DAYLITE $\neq$ N;

5. The occurence of more than one type 2 record (Pollutant Variable List) (area sources only);

6. A control record type less than 1 or greater than 3 for area sources. For point sources, the occurence of a control record type not equal to 1;

7. More than 100 pollutants specified (NUMPOLL) in the area source subroutine MTPREP.FORT control file, or a value of NUMPOLL less than 1 for the MTPREP.SAS control file;

8. The level of resolution specified for EMRES in the TAM and MTPREP control files not equal to "gridded" or "nongridded".

Speciation Module

Error Messages--

Error messages are issued and program execution terminated if any invalid data are found in either the PSPLIT file or SM Control Options File. Possible Speciation Module errors are as follows:

1. A PSPLIT or SFF record type not equal to 1, 2, 11, 12, 21, or 22 (1 - Header records; 11 - Header record No. 1, 12 - Header record No. 2; 2 - speciation factor records; 21 - Speciation record No. 1; and 22 - Speciation record No. 2.) (point and area sources);

2. More than one Run Identification (type 1) record in the Control Options File (point and area sources);

3. The diagnostic report option (type 1 record in the COF) is not specified as detailed (D), summary (S), or totals (T) for area sources and as detailed or summary for point sources;

4. More than 15 Speciation File Format (type 2) records are found in the COF for either a point or area source run. This indicates an invalid number of major pollutant classes has been specified;

5. In the area source COF, THC is not the first major pollutant category specified for speciation;

6. NO_x is not the second major pollutant category listed for speciation of area source pollutants;

7. Request for speciation of more than 32 subclasses for each major pollutant category for point and area source files;

8. A control record type not equal to 1 or 2 for the point and area source control files;

9. A missing value is found for the total number of species to be processed for area sources.

Spatial Allocation Module

Error Messages--

Fatal error messages are issued and execution is terminated if any of the following occurs in the Control Options File:

1. More than 1 Run Identification (type 1) record or Grid Definition (type 2) record for both point and area sources. For area sources only, more than one Subfile Definition (type 3) record or Pollutant List (type 4) record;

2. A report detail option not specified by detailed (D), summary (S), or totals (T) (type 1 record) for area sources and a report option not specified by detailed or summary for point sources;

3. A source type not specified by area (AS) or point source (PS) on the Run Identification record;

4. More than 66 million input records specified on area source record type 3;

5. Control record type not equal to 1, 2, 3, or 4 for area sources, or for point sources, control record type not equal to 1 or 2.

Model Input Preprocessor

Error Messages--

Fatal error messages are issued and execution is terminated if any of the following occurs in the MIP or SAS to EBCDIC conversion Control Options Files:

1. Diagnostic report option does not indicating summary (S) or totals (T) (MIP COF);
2. Source type on the Run Identification record is not specified as area source (AS) or point source (PS) (MIP COF);
3. Incorrect source type for control record type 2 (Pollutant Variable List-MIP COF)--must be area source (AS);
4. Incorrect source type for control record type 3 (Resolution record-MIP COF)--must be area source (AS);
5. The emissions resolution on the Resolution record is not specified by "gridded" or "nongridded" (MIP COF);
6. For the point source SAS-EBCDIC control file, the total number of species specified by NUMSPEC is less than zero;
7. For the area source SAS-EBCDIC control file, NUMPOLL is less than 1 or EMRES is not specified by "gridded" or "nongridded".

SUMMARY STATISTICS

Summary statistics for each FREDS module are included on the IBM job log and consist of a diagnostic report summarizing module execution and a SAS job summary. The job log must be explicitly saved or printed within 3 days after it has been produced, otherwise the job is deleted from the queue and report information will be lost. In addition, erroneous or invalid data are output to orphan files and printed with the diagnostic report when applicable. In general, three levels of detail may be specified for area source diagnostic reports: summary (S), totals (T), and detailed (D). For TAM however, only summary or detailed reports may be requested. For point sources, summary or detailed reports may be requested for each module. Although each module report may vary somewhat, a minimal summary report containing the date and time of execution, FREDS and module titles, and Control Options File listing is always reported.

Hydrocarbon Preprocessor Diagnostic Report

In addition to the statistics normally presented in the IBM job log, the FREDS hydrocarbon preprocessor provides information in the form of a summary report. If a detail option of "S" is chosen, the following is minimally provided:

- A header record with the date, time, and run title, and
- A listing of the control options specified.

If a detailed diagnostic report is specified, the following information is also printed:

- A list of emissions records with no augmentation profile match (SCC not in augmentation file);
- A listing of profile codes which appeared in the SCC-profile file but not in the weight percent-profile file; and
- A printout of the weight percent-profile file, including calculated adjustment factors by profile.

Quality Control Module Diagnostic Report

Execution of the Quality Control Module produces four possible diagnostic error reports. The reports include:

- National totals diagnostic error report;
- State totals diagnostic error report;
- SCC totals diagnostic error report; and
- Temporal allocation diagnostic error report.

Model Data Extraction Module Diagnostic Report

The following information is minimally provided for each MDEM execution (detail-summary):

- a header record with the date, time, and title (FREDS and module title);
- a listing of applicable Control Option File records; and
- the number of emissions records processed
- the number of zero emissions records deleted from each output file.

If the detailed report is requested, the following information is provided in addition to the above summary report:

- fifty records of each emissions file or subfile output from MDEM.

If the source type-AS, and the level of detail requested is totals (T), the following information is printed in addition to the above summary report:

- emissions totals for each pollutant in each emissions file.

Temporal Allocation Module Diagnostic Report

For TAM, one of two levels of detail may be specified in the Control Options File: summary or detail. MTPREP.FORT and MTPREP.SAS are controlled by their own COFs but a diagnostic report is generated by MTPREP.SAS only. The following information is printed for each TAM module run:

- a header record with the date and time of execution and the FREDS and TAM titles;
- a listing of the Control Options File for the specified source type; for area sources, this also includes the MTPREP.SAS COF listing;
- a listing of how many allocation patterns were assigned and in what manner; and
- for point source TAM runs, a listing of State/County codes with missing time zone data, including State and County.

If a detailed report is requested, a subset of the emissions file and corresponding temporal allocation factors are printed. For point source executions the first 10 observations of the file are listed; for area sources, TAM prints the first 30 records.

Speciation Module Diagnostic Report

Each execution of the Speciation Module generates a summary report with the following information:

- date, time, FREDS title, and module title;
- types 1 and 2 Control Options File records;
- speciation factor identities, e.g., speciation factor number, pollutant SAROAD code, and pollutant description;
- a printout of emission records for which no speciation profiles were present. The list includes SCC, State, and County; and
- for area sources, a printout of emission records for which no time zone data were present. The list includes SCC, State, and County.

If the "totals" option is requested for area sources, annual totals of speciated emissions are output in addition to the summary report. If a detailed report is requested, the speciation factors for point source pollutants (50 observations) or the speciated emissions for area source pollutants (200 observations) are printed in addition to the above information.

Spatial Allocation Module Diagnostic Report

The following summary is the minimum information provided for each SAM execution (detail-S):

- a header record containing the date, time, FREDS title, and module title;
- a listing of Control Option File record types 1-4 for area sources and types 1-2 for point sources;
- a listing of point source emission records for which no location data were present. The list includes the corresponding SCC, State, County, Plant ID, Point ID;
- a listing of point source emission records whose coordinates are outside grid boundaries. The list includes the corresponding SCC, State, County, Plant ID, Point ID, Latitude, Longitude, Column, and Row; and
- A listing of area source emissions records which have no matching spatial allocation factors. The list includes SCC, State, and County and pollutant emissions.

If a detailed report is requested, spatial allocation data are printed in addition to the above summary. For point source SAM executions, this includes the first 50 records; for area sources, the first 200 observations are listed. For area sources, if the "totals" summary is specified, emissions totals for each pollutant are listed in addition to the summary report.

Model Input Preprocessor Diagnostic Report

The model input preprocessor allows two levels of detail to be specified for area sources ("S" or "T") and one level for point sources. For both point and area sources, the summary report is the Control Options File and the SAS summary.

For area sources, if detail-T is requested, hourly totals are printed and a backup data set sorted by GMT is output.

For the SAS to EBCDIC conversion, a brief report echoing the control options file is printed for both point and area sources.

SAS Summary Statistics

In addition to the diagnostic report for each module execution, a SAS job log is printed for each EXEC SAS statement. The summary statistics are as follows:

- SAS options specified;
- file names and parameters for JCL DD statements corresponding to EBCDIC files;
- the number of lines in each file or data set;
- the number of variables in each file or data set;
- the number of observations per track for each file or data set;
- the time and memory used for each SAS step in the job;
- data conversions which have taken place (e.g., numeric to character); and
- generation of missing data by SAS operators or procedures.

USER WARNINGS/CONSIDERATIONS

In executing the FREDS programs, the main consideration the user should be aware of is the space (temporary and permanent) requirements for execution of each module and the available hardware (e.g., disk and tape drives). The SAS point and area source files input to FREDS contain a very large volume of data. With the execution of each module, more data are added to each output emissions file. In order to reduce what could become unmanageable storage requirements, area source annual pollutant emissions are extracted into user defined SAS variables. By abandoning the SAROAD and EMISS arrays in the area source file, file space is saved; e.g., 30 variables for 15 annual pollutants (SAROAD1-15 and EMISS1-15) are read into 15 variables. In addition, NEDS variables not pertinent for modeling applications or not referenced by FREDS are stored in a separate file (the Area Source Annual County File) or dropped. Although every effort has been made to minimize space requirements necessary for area source processing, the user is urged to evaluate the necessary requirements for execution and output. FREDS limits the user to sixty-six million records in the spatial allocation module, as this module expands the area source file by a factor of about 100. However, this is a very large volume of data and the user should not attempt to process the maximum number of records.

For point sources, the SAROAD and EMISS arrays are maintained throughout FREDS. This allows QC checks to be performed on the temporal, species, and spatial allocation factors in addition to checks on the emission records themselves. File size reduction was not as pertinent for point sources as there are considerably fewer records than are in the area source file.

In an effort to enhance processing of the 1985 NAPAP inventory, private disk packs were supplied by the NCC. The space on these packs is used for temporary data sets, work space, and sort work area. The devices listed in the Environment Section do not reflect the use of private disk packs. If these are available to the user, most temporary data sets, work space, and sort work space may be specified as disk instead of tape. Tapes, however, are recommended for permanent output files.

When using the NCC-IBM, the JES2 job log should be checked to ensure proper tape mounting, verify volume numbers, ensure that no system problems were encountered, and verify that output data sets have been catalogued. In addition, the user should always check the SAS job log and diagnostic report for each module to determine possible SAS, file, or data errors. If a detail level of "T" has been specified for the area source diagnostic report, emissions totals should be checked for validity. The Control Options File summarized in the diagnostic report should be checked to ensure the proper specifications were requested. The job log should be checked and printed or explicitly saved within 3 days to avoid deletion from the queue before the output has been checked.

For all modules, the user should check all input and output files for valid numbers of variables and observations. If an output data set from one module is directly input to another, the SAS file statistics should be compared for accuracy. If a partial listing of output data is preferred for checking purposes, the detailed report option may be specified.

Warning messages in MDEM and TAM should be evaluated to determine possible file problems or data errors. Since the area source TAM has the flexibility of processing gridded or county-level emissions, the user should be aware of possible space problems when generating hourly, speciated emissions by SCC, State, and County for the entire U.S.; e.g., gridded U.S. data which normally occupies two 9-track 6250 BPI magnetic tapes may require as many as 14 tapes when resolved by SCC, State, and County. All orphaned data sets should also be checked for possible data errors.

In calculating spatial allocation factors to be used for input to SAM, the user is limited to 160 grids per county and up to 30 spatial allocation categories by the spatial factor software and the Spatial Allocation Factor Preprocessor program (SAFP). Similarly, the arrays in the area source Spatial Allocation Module are preset to 160 grids per county. For U.S. area sources allocated to 20 x 20 km grid cells, this should not present any problems since grid cells may be allocated from the county level. For data sets where grid cells must be defined for a larger area (for example, the provincial level of Canada) or smaller grid cell sizes are requested (e.g., 5 x 5 km), the number of grids may exceed the limit.

For final processing (MIP), the user should check the summary statistics to ensure the correct files have been combined in the generation of the modeler's tape. The number of observations and variables input and output should be checked for validity. It is especially important to check the JES2 job log for this module to ensure tape volumes have been properly mounted and catalogued. Output tape data sets are generally used by programs not written in SAS, and are therefore converted to ASCII or EBCDIC characters. The job log for the SAS to ASCII/EBCDIC conversion should also be checked for possible problems or errors.

SECTION 7

ENVIRONMENT

The operating environment for each module of FREDS is described below for execution on EPA's National Computer Center IBM 3090. The description of the files accessed includes DD labels, device (disk or tape), the class of the file (permanent or temporary), and the I/O status. The device specified describes that most frequently used for processing the NAPAP Emissions Inventories. The region size for each module is discussed with respect to the SAS default region--1536K for SAS version 5.16. None of the modules require specification of an increased region size for execution. Timing estimates for a typical execution of each module, including CPU time and EXCPS (I/O operations), are also provided.

HYDROCARBON PREPROCESSOR

1. Files Accessed

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
MASTER	Tape	Permanent	Input
WTPCT	Disk	Permanent	Input
SCCPROF	Disk	Permanent	Input
ORPHAN	Disk	Permanent	Output
OUTFILE	Tape	Permanent	Output
SORTED	Tape	Temporary	Intermediate
OUTTEMP	Tape	Temporary	Intermediate

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: For point sources, an input file of 72,000 records required 45 seconds of CPU time and 22,500 EXCPS when merged with an SCC-level adjustment file of approximately 3,300 observations. For area sources, an input emissions file of 262,000 records was merged with adjustment data for 102 SCCs in 57 CPU seconds and 17,000 EXCPS.

QUALITY CONTROL MODULE

1. Files Accessed

DD Label/Description	Device	Class	I/O
COF	Disk	Permanent	Input
FREDS data files	Tape	Permanent	Input
Baseline Emissions Totals	Disk	Permanent	Input/Output
Intermediate Emissions Totals	Disk	Permanent	Input/Output
REPORT1	Disk	Permanent	Output
REPORT2	Disk	Permanent	Output
REPORT3	Disk	Permanent	Output
REPORT5	Disk	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: QCM will process most FREDS emissions files with under 300,000 observations in less than 2 minutes total CPU time. Point source Temporal Allocation output requires additional time for QA of Temporal Allocation factors. Area source Spatial Allocation. Temporal Allocation, and Model Input Preprocessor outputs generally require greater amounts of QCM processing time in comparison to other outputs because the output files from these routines are relatively larger and greater in number than those of the other modules. Following are a few examples of QCM execution times from a test series:

Module	Records	Total QCM CPU time (minutes:seconds)
Area Source Hydrocarbon Preprocessor	206,568	1:28
Point Source Hydrocarbon Preprocessor	127,693	1:05
Point Source Temporal Allocation	81,405	5:47
Area Source Spatial Allocation	1,338,277	15:06

MODEL DATA EXTRACTION MODULE

Point Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
MAJTEMP	Tape	Temporary	Intermediate
EMIS	Tape	Permanent	Input
MAJMISC	Tape	Permanent	Output
MINMISC	Disk	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Time Estimates: The Model Data Extraction Module required 22 CPU seconds (9000 EXCPS) to process a point source file of 63,500 records.

Area Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
TEMP	Disk	Temporary	Intermediate
EMIS	Tape	Permanent	Input
MAJMISC	Tape	Permanent	Output
MAJMISC1	Tape	Permanent	Output
MAJMISC2	Tape	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: An area source file containing 262,237 records required a CPU processing time of one minute seven seconds (EXCPS=5,700).

TEMPORAL ALLOCATION MODULE

Point Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
WORK	Disk	Temporary	Intermediate
TEMP	Tape	Temporary	Intermediate
TEMP1	Disk	Temporary	Intermediate
TEMP2	Disk	Temporary	Intermediate
TEMP3	Disk	Temporary	Intermediate
TEMP4	Disk	Temporary	Intermediate
TEMP5	Disk	Temporary	Intermediate
INFILE	Tape	Permanent	Input
TZF	Disk	Permanent	Input
TAFF	Disk	Permanent	Input
OUTFILE	Tape	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: Temporal allocation of 63,535 U.S. point source records for 10 pollutants required a CPU time of 4 minutes 39 seconds amd 45,000 EXCPS.

Area Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
TEMP	Tape	Temporary	Intermediate
SORTIN	Tape	Temporary	Intermediate
TAMIN	Tape	Permanent	Input
TAFF	Disk	Permanent	Input
STATE	Tape	Temporary	Intermediate
SCC	Tape	Temporary	Intermediate
SORTOUT,FT11F001	Tape	Temporary	Intermediate (SYNCSORT output, MTPREP.FORT input)

DD Label	Device	Class	I/O
SORTWKnn	Disk	Temporary	Intermediate
FT10F001	Disk	Permanent	Input (to MTPREP.FORT)
FT20F001,INFILE	Tape	Temporary	Intermediate (MTPREP.FORT output, MTPREP.SAS input)
OUTFILE	Tape	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: Processing of the area source THC/NO_x file (37 pollutants and 907,565 input records) for one temporal scenario (includes execution of the main TAM Module, SYNCSORT, MTPREP.FORT, and MTPREP.SAS) required a total of 36 minutes 50 seconds CPU time. The TSP/SO_2 file containing 20 pollutants and 926,401 input records required a CPU time of 26 minutes 42 seconds. Average EXCPS for these runs are between 200,000 and 230,000.

SPECIATION MODULE

Point Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
INFILE	Tape	Permanent	Input
SFF	Disk	Permanent	Input
PSPLIT	Disk	Permanent	Input
OUTFILE1	Tape	Permanent	Output
OUTFILE2	Disk	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: Speciation of 63,500 records into 49 subclasses yielding 59 total pollutants, required 29 CPU seconds and 18,500 EXCPS.

Area Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
INFILE	Tape	Permanent	Input
SFF	Disk	Permanent	Input
PSPLIT	Disk	Permanent	Input
SAROAD	Disk	Permanent	Input
TZF	Disk	Permanent	Input
SMOUT	Tape	Permanent	Output
ORPHAN	Disk	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: For a THC/NO_x file of 133,000 observations, speciation into 34 classes required 1 minute 12 seconds of CPU time (6700 EXCPS). A TSP/SO_2 file of similar length was speciated into 15 particulate classes in 47 CPU seconds (5700 EXCPS).

SPATIAL ALLOCATION MODULE

Point Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
INFILE	Tape	Permanent	Input
OUTFILE1	Tape	Permanent	Output
OUTFILE2	Disk	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: Spatial allocation of 10 pollutants for 63,535 point source records required 6 CPU seconds (3000 EXCPS).

Area Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
SAMIN	Tape	Permanent	Input
SAFF	Tape	Permanent	Input
SAFFIN	Disk	Temporary	Intermediate
SAFFOUT	Disk	Temporary	Intermediate
SAMOUT	Tape	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: Spatial allocation of the THC/NO_x file (e.g. 37 pollutants and 132,884 input records) required 19 minutes 8 seconds CPU time (81,000 EXCPS). The TSP/SO_2 file (20 pollutants and 129,990 input records) required a CPU time of 14 minutes 34 seconds (68,000 EXCPS).

MODEL INPUT PREPROCESSOR

Point Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
IN1	Tape	Permanent	Input
IN2	Tape	Permanent	Input
INn	Tape	Permanent	Input
MIPIN	Tape	Temporary	Intermediate
MIPOUT	Tape	Permanent	Output
INFILE	Tape	Permanent	Input, intermediate
FILE1	Tape	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: MIP execution for one point source file (63,535 records and 59 pollutants) required 7 minutes 22 seconds CPU time and 69,000 EXCPS, including the SAS to ASCII conversion job step.

Area Sources

1. Files Accessed:

DD Label	Device	Class	I/O
COF	Disk	Permanent	Input
IN1	Tape	Permanent	Input, intermediate
IN2	Tape	Permanent	Input, intermediate
IN3	Tape	Permanent	Input, intermediate
MIPIN	Tape	Temporary	Intermediate
MIPOUT	Tape	Permanent	Output
MIPBACK	Tape	Permanent	Output
INFILE	Tape	Permanent	Input, intermediate
FILE1	Tape	Permanent	Output
FILE2	Tape	Permanent	Output

2. Region Size: SAS version 5.16 default.

3. Timing Estimates: For the 1985 NAPAP inventory, MIP was used to concatenate US and Canadian TAM output files into a complete modelers inventory. Each THC/NO_x split file containing 579,336 observations and 37 pollutants was processed in approximately 18 minutes 25 seconds CPU time. TSP/SO_2 files required approximately 12 minutes CPU time each. Between 100,000 and 110,000 EXCPS were required for a typical MIP execution.

SECTION 8

EXAMPLE SPECIATION MODULE RUN AND DESCRIPTION

To present a sample run of all FREDS modules would be both cumbersome and redundant since the runstreams are provided in Section 3 and the job output from each module is presented in Section 4. Instead, a sample execution of one module, the Speciation Module (SM) for area source emissions, is provided on the following pages.

For the 1985 NAPAP inventory, the SM input emissions file is divided into two segments containing different pollutants. As a result, two SM runs are required: one for the THC/NO_x File and one for the TSP/SO_2 File. The module run example presented herein consists of the Control Options File and JCL runstream for each job. The complete job output is also provided for the THC/NO_x File run. For a description of the emissions data, refer to Section 4--Input/Output Format Descriptions. SM speciates THC into 32 photochemical reactivity classes and NO_x into NO and NO_2. Particulates in the TSP/SO_2 File are speciated into 15 classes using data in the Speciation Factor File (SFF).

The job output presented is segmented into three sections: JES2 Job Log (Segment 1), SAS Job Log (Segment 2) and diagnostic report (Segment 3). The JES2 Job Log is printed for all batch jobs submitted to the NCC-IBM. It contains job statistics such as allocation of disk space and tape drives, volume serial numbers for temporary and permanent tapes, cataloging procedures for permanent data sets, and CPU time. The SAS Job Log summarizes SAS procedures executed by each SAS job step. The last segment, the diagnostic report, summarizes the actions of the Speciation Module. In this example, detailed reports were requested, and so a partial listing of the speciated emissions is also included.

CONTROL OPTIONS FILE - THC/NO_x FILE

```
1 AS D DATA      YN 1985 FREDS - AREA SOURCE SM, VERSION 2
2 ATHC      32
2 ANOX      2
2 ATSP      15
```

CONTROL OPTIONS FILE - TSP/SO_2 FILE

```
1 AS D DATA      NY 1985 FREDS - AREA SOURCE SM, VERSION 2
2 ATHC      32
2 ANOX      2
2 ATSP      15
```

EXECUTION DECK -THC/NO_x FILE

```
//xxxSPMA JOB (aaaafffff,Mxxx,,49),SPR,NOTIFY=xxx,TIME=(2,0)
/*ROUTE PRINT HOLD
//*******************************************************************
//*******************************************************************
//*
//*   APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)
//*
//*   PROGRAM: SPECIATION MODULE (SM) - AREA SOURCES
//*
//*   LANGUAGE: OS JCL (SYSTEM 370)
//*
//*   PURPOSE: TO EXECUTE THE SAS CODE FOR SM, PROVIDING THE
//*            FILENAMES AND PARAMETERS NECESSARY
//*
//*******************************************************************
//*******************************************************************
//*
//*   INSTRUCTIONS: MODIFY THE RUNSTREAM TO RUN SM AS FOLLOWS:
//*
//*       1. CALCULATE TIME REQUIREMENT
//*       2. PROVIDE FILE NAMES TO DD LABELS AS FOLLOWS
//*
//*            DD LABEL            FILE DESCRIPTION
//*           ------------------------------------------------------
//*            COF         CONTROL OPTIONS FILE
//*            INFILE      EMISSION SUBFILE LIBRARY (INPUT)
//*            SMOUT       SPECIATED EMISSION SUBFILE LIBRARY (OUTPUT)
//*            ORPHAN      SM ORPHAN EMISSION FILE
//*            SFF         SPECIATION FACTOR FILE
//*            PSPLIT      PSPLIT OUTPUT FILE
//*            SAROAD      POLLUTANT CLASS DESCRIPTION FILE
//*            SYSIN       SM SAS SOURCE CODE
//*
//*       3. CALCULATE SPACE REQUIREMENTS FOR OUTPUT FILE
//*       4. SUBMIT
//*
//*******************************************************************
//*******************************************************************
//*
//*     1985 NAPAP INVENTORY - U.S. AREA SOURCES
//*
//SM   EXEC SAS,OPTIONS='MACRO SORTLIST SORTMSG'
//WORK   DD UNIT=DISK,SPACE=(CYL,1600,RLSE),VOL=SER=nnnnnn
//$ORTPARM DD   *
  LIST
  BMSG
  MSG
  MSGDD=SYSOUT
/*
//SYSOUT DD   SYSOUT=A
//SYSIN  DD DSN=xxxaaaa.FREDS85.SPM.AS.ALL.SAS,DISP=SHR
//TZF    DD DSN=xxxaaaa.FREDS85.TZF.USA.EBCDAT,DISP=SHR
//COF    DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.THC.COF,DISP=SHR
//INFILE DD DSN=xxxaaaa.FREDS85.MDM.AS.USA.V30.THC.SASDAT,DISP=SHR
//SMOUT  DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.V30.THC.SASDAT,UNIT=TAPE,
//       DISP=(NEW,CATLG,DELETE),LABEL=(1,SL,,EXPDT=89365)
//ORPHAN DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.V30.THC.ORPH.SASDAT,
//       DISP=(NEW,CATLG,DELETE),UNIT=DISK,
//       SPACE=(TRK,(600,100),RLSE)
//SFF    DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.SFF.EBCDAT,DISP=SHR
//PSPLIT DD DSN=xxxaaaa.FREDS85.SPM.AP.USA.PSPLIT.EBCDAT,DISP=SHR
//SAROAD DD DSN=xxxaaaa.FREDS85.SPM.AS.ALL.SAROAD.EBCDAT,DISP=SHR
/*
//
```

EXECUTION DECK - TSP/SO_2 FILE

```
00010 //xxxSPMA JOB (aaaafffff,Mxxx,,49),SPR,NOTIFY=xxx,TIME=(2,0)
00030 /*ROUTE PRINT HOLD
00040 //*********************************************************************
00050 //*********************************************************************
00060 //*
00070 //*   APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)
00080 //*
00090 //*   PROGRAM: SPECIATION MODULE (SM) - AREA SOURCES
00100 //*
00110 //*   LANGUAGE: OS JCL (SYSTEM 370)
00120 //*
00130 //*   PURPOSE: TO EXECUTE THE SAS CODE FOR SM, PROVIDING THE
00140 //*            FILENAMES AND PARAMETERS NECESSARY
00150 //*
00160 //*********************************************************************
00170 //*********************************************************************
00180 //*
00190 //*   INSTRUCTIONS: MODIFY THE RUNSTREAM TO RUN SM AS FOLLOWS:
00200 //*
00210 //*       1. CALCULATE TIME REQUIREMENT
00220 //*       2. PROVIDE FILE NAMES TO DD LABELS AS FOLLOWS
00230 //*
00240 //*            DD LABEL           FILE DESCRIPTION
00250 //*           ---------------------------------------------------
00260 //*            COF        CONTROL OPTIONS FILE
00270 //*            INFILE     EMISSION SUBFILE LIBRARY (INPUT)
00280 //*            SMOUT      SPECIATED EMISSION SUBFILE LIBRARY (OUTPUT)
00290 //*            ORPHAN     SM ORPHAN EMISSION FILE
00300 //*            SFF        SPECIATION FACTOR FILE
00310 //*            PSPLIT     PSPLIT OUTPUT FILE
00320 //*            SAROAD     POLLUTANT CLASS DESCRIPTION FILE
00330 //*            SYSIN      SM SAS SOURCE CODE
00340 //*
00350 //*       3. CALCULATE SPACE REQUIREMENTS FOR OUTPUT FILE
00360 //*       4. SUBMIT
00370 //*
00380 //*********************************************************************
00390 //*********************************************************************
00400 //*
00410 //*     1985 NAPAP INVENTORY - U.S. AREA SOURCES
00420 //*
00430 //SM    EXEC SAS,OPTIONS='MACRO SORTLIST SORTMSG'
00440 //WORK   DD UNIT=DISK,SPACE=(CYL,1600,RLSE),VOL=SER=nnnnnn
00450 //$ORTPARM DD   *
00460   LIST
00470   BMSG
00480   MSG
00490   MSGDD=SYSOUT
00500 /*
00510 //SYSOUT DD   SYSOUT=A
00520 //SYSIN  DD DSN=xxxaaaa.FREDS85.SPM.AS.ALL.SAS,DISP=SHR
00530 //TZF    DD DSN=xxxaaaa.FREDS85.TZF.USA.EBCDAT,DISP=SHR
00540 //COF    DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.TSP.COF,DISP=SHR
00550 //INFILE DD DSN=xxxaaaa.FREDS85.MDM.AS.USA.V30.TSP.SASDAT,DISP=SHR
00560 //SMOUT  DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.V30.TSP.SASDAT,UNIT=TAPE,
00570 //        DISP=(NEW,CATLG,DELETE),LABEL=(1,SL,,EXPDT=89365)
00580 //ORPHAN DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.V30.TSP.ORPH.SASDAT,
00590 //        DISP=(NEW,CATLG,DELETE),UNIT=DISK,
00591 //        SPACE=(TRK,(600,100),RLSE)
00600 //SFF    DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.SFF.EBCDAT,DISP=SHR
00610 //PSPLIT DD DSN=xxxaaaa.FREDS85.SPM.AP.USA.PSPLIT.EBCDAT,DISP=SHR
00620 //SAROAD DD DSN=xxxaaaa.FREDS85.SPM.AS.ALL.SAROAD.EBCDAT,DISP=SHR
00630 /*
00640 //
```

OUTPUT - THC/NO_x FILE

Page 1 of 29

```
                    J E S 2  J O B  L O G  --  S Y S T E M  E P A 2  --  N O D E  N C C I B M 1
--------- JOB 2960  IEF097I xxxSPMA  - USER xxx      ASSIGNED
17.02.36 JOB 2960  ICH70001I xxx      LAST ACCESS AT 16:45:44 ON WEDNESDAY, JANUARY 4, 1989
17.02.36 JOB 2960  $HASP373 xxxSPMA  STARTED - INIT 73 - CLASS E - SYS EPA2
17.02.44 JOB 2960 *IEF233A M 490,017011,,xxxSPMA,SAS
17.02.44 JOB 2960 *TMS002  IEF233A M 494,SCRTCH,SL,xxxSPMA,SAS
17.17.03 JOB 2960  IECTMS9 494,021355,xxxSPMA ,SMOUT   ,89365,001,SA.V30.THC.SASDAT
17.17.04 JOB 2960  IEC705I TAPE ON 494,021355,SL,6250 BPI,xxxSPMA,SAS
17.36.53 JOB 2960  IEF234E K 490,017011,PVT,xxxSPMA,SAS
17.36.53 JOB 2960  IEF234E K 494,021355,PVT,xxxSPMA,SAS
17.36.54 JOB 2960  NCC005I * JOB xxxSPMA  ENDED 01/04/89 AT 17:36:54, PRTY=04, CC=0000
17.36.54 JOB 2960  $HASP395 xxxSPMA  ENDED
------ JES2 JOB STATISTICS ------
-    04 JAN 89 JOB EXECUTION DATE
            63 CARDS READ
-        2,081 SYSOUT PRINT RECORDS
-            0 SYSOUT PUNCH RECORDS
-          190 SYSOUT SPOOL KBYTES
-        34.29 MINUTES EXECUTION TIME
   1     //xxxSPMA JOB (aaaafffff,MYHD,,49),SPR,NOTIFY=xxx,TIME=(2,0),PRTY=4      JOB 2960
         ***ROUTE PRINT HOLD                                                      0000003
         ************************************************************************00000040
         ************************************************************************00000050
         ***                                                                     00000060
         ***   APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)      00000070
         ***                                                                     00000080
         ***   PROGRAM: SPECIATION MODULE (SM) - AREA SOURCES                    00000090
         ***                                                                     00000100
         ***   LANGUAGE: OS JCL (SYSTEM 370)                                     00000110
         ***                                                                     00000120
         ***   PURPOSE: TO EXECUTE THE SAS CODE FOR SM, PROVIDING THE            00000130
         ***            FILENAMES AND PARAMETERS NECESSARY                       00000140
         ***                                                                     00000150
         ************************************************************************00000160
         ************************************************************************00000170
         ***                                                                     00000180
         ***   INSTRUCTIONS: MODIFY THE RUNSTREAM TO RUN SM AS FOLLOWS:          00000190
         ***                                                                     00000200
         ***       1. CALCULATE TIME REQUIREMENT                                 00000210
         ***       2. PROVIDE FILE NAMES TO DD LABELS AS FOLLOWS                 00000220
         ***                                                                     00000230
         ***             DD LABEL            FILE DESCRIPTION                    00000240
         ***            ---------------------------------------------------------00000250
         ***             COF          CONTROL OPTIONS FILE                       00000260
         ***             INFILE       EMISSION SUBFILE LIBRARY (INPUT)           00000270
         ***             SMOUT        SPECIATED EMISSION SUBFILE LIBRARY (OUTPUT) 00000280
         ***             ORPHAN       SM ORPHAN EMISSION FILE                    00000290
         ***             SFF          SPECIATION FACTOR FILE                     00000300
         ***             PSPLIT       PSPLIT OUTPUT FILE                         00000310
         ***             SAROAD       POLLUTANT CLASS DESCRIPTION FILE           00000320
         ***             SYSIN        SM SAS SOURCE CODE                         00000330
         ***                                                                     00000340
         ***       3. CALCULATE SPACE REQUIREMENTS FOR OUTPUT FILE               00000350
         ***       4. SUBMIT                                                     00000360
         ***                                                                     00000370
         ************************************************************************00000380
         ************************************************************************00000390
         ***                                                                     00000400
         ***     1985 NAPAP INVENTORY - U.S. AREA SOURCES                        00000410
         ***                                                                     00000420
   2     //SM   EXEC SAS,OPTIONS='MACRO SORTLIST SORTMSG'                        00000430
   3     XXSAS  PROC ENTRY=SASLPA,OPTIONS=,SORT=4,GREGION=1536K,                 00010000
```

```
          XX        PRINT=A,                                                 00020000
          XX        PLRECL=255,    > 255 CAUSES PROBLEMS WITH QED/ISPF EDITOR 00030000
          XX        ADABAS=DDCARD   EXTRACTA DEFAULT TO PADABAS              00040000
          *********************************************************************** 00050000
          ***  PRODUCT: OS SAS RELEASE 5.16                                  *** 00060000
          ***  DOCUMENTATION: SAS USER'S GUIDE: BASICS, VERSION 5 EDITION    *** 00070000
          ***                 SAS USER'S GUIDE: STATISTICS, VERSION 5 EDITION *** 00080000
          ***                 SAS TECHNICAL REPORT: P-146  CHANGES AND       *** 00090000
          ***                    ENHANCEMENTS TO THE VERSION 5 SAS SYSTEM    *** 00100000
          ***  FROM: SAS INSTITUTE INC., BOX 8000, CARY, NC  27511-8000      *** 00110000
          *********************************************************************** 00120000
    4     XXSAS     EXEC PGM=&ENTRY,PARM='&OPTIONS SORT=&SORT',REGION=&GREGION    00130000
          IEF653I SUBSTITUTION JCL - PGM=SASLPA,PARM='MACRO SORTLIST SORTMSG SORT=4',REGION=1536K
    5     XXLIBRARY   DD DISP=(MOD,PASS),DSN=&LIBRARY,                       00140000
          XX             UNIT=SYSDR,SPACE=(CYL,(1,,20))                      00150000
    6     XXSTEPLIB   DD DISP=SHR,DSN=SYS2.SAS.V1R5M16.LIBRARY               00160004
    7     XX          DD DISP=SHR,DSN=SYS1.PLIBASE                           00170000
    8     XX          DD DISP=(OLD,PASS),DSN=*.LIBRARY,VOL=REF=*.LIBRARY     00180000
    9     XXMAPS      DD DISP=SHR,DSN=SYS2.SAS.V1R5M16.MAPS                  00190000
   10     XXSASUTL    DD DISP=SHR,DSN=SYS2.SAS.V1R5M16.UTILLIB               00200000
   11     XXSASHELP   DD DISP=SHR,DSN=SYS2.SAS.V1R5M16.SASHELP               00210000
   12     XXSASAUTOS  DD DISP=SHR,DSN=SYS2.SAS.V1R5M16.MACAUTOS              00220000
   13     XXEXTPARM   DD DISP=SHR,DSN=SYS2.SAS.V1R5M16.EXTAPARM(EXTPARM)     00230000
   14     XXDDCARD    DD DISP=SHR,DSN=SYS2.SAS.V1R5M16.EXTAPARM(&ADABAS)     00240000
          IEF653I SUBSTITUTION JCL - DISP=SHR,DSN=SYS2.SAS.V1R5M16.EXTAPARM(DDCARD)
   15     //WORK    DD UNIT=DISK,SPACE=(CYL,1600,RLSE),VOL=SER=NAPA02        00000440
          X/WORK      DD UNIT=SYSDR,SPACE=(6160,(500,200),,,ROUND)           00250000
   16     XXFT06F001  DD SYSOUT=&PRINT,DCB=(BLKSIZE=141,LRECL=137,RECFM=VBA)  00260000
          IEF653I SUBSTITUTION JCL - SYSOUT=A,DCB=(BLKSIZE=141,LRECL=137,RECFM=VBA)
   17     XXFT11F001  DD SYSOUT=&PRINT,DCB=(BLKSIZE=141,LRECL=137,RECFM=VBA)  00270000
          IEF653I SUBSTITUTION JCL - SYSOUT=A,DCB=(BLKSIZE=141,LRECL=137,RECFM=VBA)
   18     XXFT12F001  DD SYSOUT=&PRINT,DCB=(BLKSIZE=264,LRECL=&PLRECL,RECFM=VBA)  00280000
          IEF653I SUBSTITUTION JCL - SYSOUT=A,DCB=(BLKSIZE=264,LRECL=255,RECFM=VBA)
   19     XXFT13F001  DD SYSOUT=B,DCB=(RECFM=F,BLKSIZE=80)                   00290000
          ***FT14F001  DD DUMMY **THIS DD STATMENT USED FOR CALCOMP PLOTTER JOBS  00300000
   20     XXFT15F001  DD UNIT=SYSDR,SPACE=(400,(100,300)),                   00310000
          XX             DCB=(RECFM=FB,LRECL=80,BLKSIZE=400,BUFNO=1)         00320000
   21     //$ORTPARM DD   *                                                  00000450
          X/$ORTPARM   DD DSN=SYS1.PRODPROC(SASSORTP),DISP=SHR               00330000
   22     //SYSOUT DD   SYSOUT=A                                             00000510
   23     //SYSIN  DD DSN=xxxaaaa.FREDS85.SPM.AS.ALL.SAS,DISP=SHR             00000520
   24     //TZF    DD DSN=xxxaaaa.FREDS85.TZF.USA.EBCDAT,DISP=SHR             00000530
   25     //COF    DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.THC.COF,DISP=SHR         00000540
   26     //INFILE DD DSN=xxxaaaa.FREDS85.MDM.AS.USA.V30.THC.SASDAT,DISP=SHR  00000550
   27     //SMOUT  DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.V30.THC.SASDAT,UNIT=TAPE,  00000560
          //        DISP=(NEW,CATLG,DELETE),LABEL=(1,SL,,EXPDT=89365)        00000570
   28     //ORPHAN DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.V30.THC.ORPH.SASDAT,    00000580
          //        DISP=(NEW,CATLG,DELETE),UNIT=DISK,                       00000590
          //        SPACE=(TRK,(600,100),RLSE)                               00000591
   29     //SFF    DD DSN=xxxaaaa.FREDS85.SPM.AS.USA.SFF.EBCDAT,DISP=SHR      00000600
   30     //PSPLIT DD DSN=xxxaaaa.FREDS85.SPM.AP.USA.PSPLIT.EBCDAT,DISP=SHR   00000610
   31     //SAROAD DD DSN=xxxaaaa.FREDS85.SPM.AS.ALL.SAROAD.EBCDAT,DISP=SHR   00000620
ICH70001I xxx      LAST ACCESS AT 16:45:44 ON WEDNESDAY, JANUARY 4, 1989
IEF236I ALLOC. FOR xxxSPMA SAS SM
IEF237I 850  ALLOCATED TO LIBRARY
IEF237I 955  ALLOCATED TO STEPLIB
IEF237I 904  ALLOCATED TO
IEF237I 850  ALLOCATED TO
IEF237I 881  ALLOCATED TO SYS00010
IEF237I 86F  ALLOCATED TO MAPS
IEF237I 955  ALLOCATED TO SASUTL
IEF237I 955  ALLOCATED TO SASHELP
```

OUTPUT - THC/NO_x FILE

```
IEF237I 955  ALLOCATED TO SASAUTOS
IEF237I 86F  ALLOCATED TO EXTPARM
IEF237I 86F  ALLOCATED TO DDCARD
IEF237I 94D  ALLOCATED TO WORK
IEF237I JES2 ALLOCATED TO FT06F001
IEF237I JES2 ALLOCATED TO FT11F001
IEF237I JES2 ALLOCATED TO FT12F001
IEF237I JES2 ALLOCATED TO FT13F001
IEF237I 9A3  ALLOCATED TO FT15F001
IEF237I JES2 ALLOCATED TO $ORTPARM
IEF237I JES2 ALLOCATED TO SYSOUT
IEF237I 953  ALLOCATED TO SYSIN
IEF237I 881  ALLOCATED TO SYS00012
IEF237I 949  ALLOCATED TO TZF
IEF237I 86E  ALLOCATED TO COF
IEF237I 49D  ALLOCATED TO INFILE
IEF237I 494  ALLOCATED TO SMOUT
IEF237I 896  ALLOCATED TO ORPHAN
IEF237I 846  ALLOCATED TO SFF
IEF237I 861  ALLOCATED TO PSPLIT
IEF237I 860  ALLOCATED TO SAROAD
IEF237I 830  ALLOCATED TO SASSWK01
IEF285I   SYS89004.T170847.RA000.xxxSPMA.R0000000      DELETED
IEF285I   VOL SER NOS= WORK88.
IEF237I 90A  ALLOCATED TO SASSWK01
IEF285I   SYS89004.T171446.RA000.xxxSPMA.R0000001      DELETED
IEF285I   VOL SER NOS= WORK88.
IEF142I xxxSPMA SAS SM - STEP WAS EXECUTED - COND CODE 0000
IEF285I   SYS89004.T170236.RA000.xxxSPMA.LIBRARY       PASSED
IEF285I   VOL SER NOS= WORK80.
IEF285I   SYS2.SAS.V1R5M16.LIBRARY                     KEPT
IEF285I   VOL SER NOS= PLIB02.
IEF285I   SYS1.PLIBASE                                 KEPT
IEF285I   VOL SER NOS= PLIB03.
IEF285I   SYS89004.T170236.RA000.xxxSPMA.LIBRARY       PASSED
IEF285I   VOL SER NOS= WORK80.
IEF285I   CATALOG.VUCAT01A                             KEPT
IEF285I   VOL SER NOS= UCAT10.
IEF285I   SYS2.SAS.V1R5M16.MAPS                        KEPT
IEF285I   VOL SER NOS= PLIB01.
IEF285I   SYS2.SAS.V1R5M16.UTILLIB                     KEPT
IEF285I   VOL SER NOS= PLIB02.
IEF285I   SYS2.SAS.V1R5M16.SASHELP                     KEPT
IEF285I   VOL SER NOS= PLIB02.
IEF285I   SYS2.SAS.V1R5M16.MACAUTOS                    KEPT
IEF285I   VOL SER NOS= PLIB02.
IEF285I   SYS2.SAS.V1R5M16.EXTAPARM                    KEPT
IEF285I   VOL SER NOS= PLIB01.
IEF285I   SYS2.SAS.V1R5M16.EXTAPARM                    KEPT
IEF285I   VOL SER NOS= PLIB01.
IEF285I   SYS89004.T170236.RA000.xxxSPMA.R0000001      DELETED
IEF285I   VOL SER NOS= nnnnnn.
IEF285I   JES2.JOB02960.S0000102                       SYSOUT
IEF285I   JES2.JOB02960.S0000103                       SYSOUT
IEF285I   JES2.JOB02960.S0000104                       SYSOUT
IEF285I   JES2.JOB02960.S0000105                       SYSOUT
IEF285I   SYS89004.T170236.RA000.xxxSPMA.R0000002      DELETED
IEF285I   VOL SER NOS= WORK8C.
IEF285I   JES2.JOB02960.SI000101                       SYSIN
IEF285I   JES2.JOB02960.S0000106                       SYSOUT
IEF285I   xxxaaaa.FREDS85.SPM.AS.ALL.SAS               KEPT
IEF285I   VOL SER NOS= USR181.
```

OUTPUT - THC/NO_x FILE

```
IEF285I   CATALOG.VUCAT01B                             KEPT
IEF285I   VOL SER NOS= UCAT10.
IEF285I   xxxaaaa.FREDS85.TZF.USA.EBCDAT               KEPT
IEF285I   VOL SER NOS= USR067.
IEF285I   xxxaaaa.FREDS85.SPM.AS.USA.THC.COF           KEPT
IEF285I   VOL SER NOS= USR185.
IEF285I   xxxaaaa.FREDS85.MDM.AS.USA.V30.THC.SASDAT    KEPT
IEF285I   VOL SER NOS= 017011.
IEF285I   xxxaaaa.FREDS85.SPM.AS.USA.V30.THC.SASDAT    CATALOGED
IEF285I   VOL SER NOS= 021355.
IEF285I   xxxaaaa.FREDS85.SPM.AS.USA.V30.THC.ORPH.SASDAT  CATALOGED
IEF285I   VOL SER NOS= USR054.
IEF285I   xxxaaaa.FREDS85.SPM.AS.USA.SFF.EBCDAT        KEPT
IEF285I   VOL SER NOS= USR016.
IEF285I   xxxaaaa.FREDS85.SPM.AP.USA.PSPLIT.EBCDAT     KEPT
IEF285I   VOL SER NOS= USR069.
IEF285I   xxxaaaa.FREDS85.SPM.AS.ALL.SAROAD.EBCDAT     KEPT
IEF285I   VOL SER NOS= USR055.
NCC950I ****************** U.S.EPA  SYSTEM EPA2 - STEP SUMMARY *****************
NCC949I *                                                                      *
NCC950I * JOB xxxSPMA    STEP SAS                                   CC:  0000  *
NCC949I *                                                                      *
NCC950I *  START WEDNESDAY 01/04/89 AT 17:02:37   STOP 01/04/89 AT 17:36:53     *
NCC950I *    34:16.75 ELAPSED    1:11.47 TCB    0:01.05 SRB    1:12.52 TOT CPU *
NCC949I *                                                                      *
NCC949I *                                                                      *
NCC950I *  MEMORY:      0K VIRTUAL ADDRESS SPACE,        16356K                 *
NCC950I *  EXCPS:       3790 DA,     2927 MT,         0 OTHER,       6717 TOTAL  *
NCC950I *  EXCPS BY UNIT:  850:         0    955:          84   904:        0   *
NCC950I *  850:        0   881:         0    86F:           0   955:        0   *
NCC950I *  955:        0   955:         0    86F:           0   86F:        0   *
NCC950I *  94D:     2803   000:         0    000:           0   000:        0   *
NCC950I *  000:        0   9A3:         0    000:           0   000:        0   *
NCC950I *  953:       16   881:         0    949:          98   86E:        2   *
NCC950I *  49D:      196   494:      2731    896:          48   846:        0   *
NCC950I *  861:      696   860:         3    881:           0   881:        0   *
NCC950I *  830:       17   90A:        23                                      *
NCC950I *  PAGES IN:             0 VIO        1510 SWAP           0 OTHER      *
NCC950I *  PAGES OUT:            0 VIO        1510 SWAP           0 OTHER      *
NCC950I *            19817 PAGE SECONDS              1951.49 RESIDENT SECONDS  *
NCC949I *                                                                      *
NCC950I *  CPU  :-    1:12.52  AT $775/HR                            $31.22    *
NCC950I *  EXCPS:-       6717  AT $.45/1000                           $6.05    *
NCC950I *  TOTAL COST FOR STEP SAS      AT PRTY=4   (2.0) =            $37.27    *
NCC949I ************************************************************************
IEF373I STEP /SAS   / START 89004.1702
IEF374I STEP /SAS   / STOP  89004.1736 CPU  1MIN 11.47SEC SRB  0MIN 01.05SEC VIRT  1536K SYS  312K EXT  5652K SYS  8856K
IEF237I 850  ALLOCATED TO SYS00003
IEF285I   SYS89004.T173653.RA000.xxxSPMA.R0000003      KEPT
IEF285I   VOL SER NOS= WORK80.
IEF285I   SYS89004.T170236.RA000.xxxSPMA.LIBRARY       DELETED
IEF285I   VOL SER NOS= WORK80.
IEF285I   SYS89004.T170236.RA000.xxxSPMA.LIBRARY       KEPT
IEF285I   VOL SER NOS= WORK80.
NCC951I ****************** U.S.EPA  SYSTEM EPA2 - JOB SUMMARY ******************
NCC949I *                                                                      *
NCC951I * JOB xxxSPMA  0001 STEPS                                   CC:  0000  *
NCC949I *                                                                      *
NCC951I *  SUBMIT WEDNESDAY 01/04/89 AT 16:46:56            15:40.70 ON QUEUE *
NCC951I *  START 01/04/89 AT 17:02:37               STOP 01/04/89 AT 17:36:54  *
NCC951I *    34:17.25 ELAPSED    1:11.47 TCB    0:01.05 SRB    1:12.52 TOT CPU *
NCC949I *                                                                      *
```

OUTPUT - THC/NO_x FILE

```
NCC949I *                                                                     *
NCC951I *  CPU  :-    1:12.52  AT $775/HR                             $31.22  *
NCC951I *  EXCPS:-       6717  AT $.45/1000                            $6.05  *
NCC951I *  TOTAL COST FOR JOB  xxxSPMA  AT PRTY=4   (2.0) =           $37.27  *
NCC949I ***********************************************************************
IEF375I  JOB /xxxSPMA / START 89004.1702
IEF376I  JOB /xxxSPMA / STOP  89004.1736 CPU    1MIN 11.47SEC SRB    0MIN 01.05SEC
```

```
1          SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM    PROC SAS   17:02 WEDNESDAY, JANUARY 4, 1989
NOTE: COPYRIGHT (C) 1984,1986 SAS INSTITUTE INC., CARY, N.C.  27511, U.S.A.
NOTE: THE JOB xxxSPMA HAS BEEN RUN UNDER RELEASE 5.16 OF SAS AT ENVIRONMENTAL PROTECTION AGENCY (01189001).
NOTE: CPUID   VERSION = 31  SERIAL = 072402  MODEL = 3090 .
      CPUID   VERSION = 31  SERIAL = 172402  MODEL = 3090 .
      CPUID   VERSION = 31  SERIAL = 272402  MODEL = 3090 .
NOTE: SAS OPTIONS SPECIFIED ARE:
      MACRO SORTLIST SORTMSG SORT=4

1          OPTIONS MPRINT DQUOTE;                                                  00000010
2          *---------------------------------------------------------------------*00000020
3                                                                                  00000030
4            APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)          00000040
5                                                                                  00000050
6            PROGRAM: SPECIATION MODULE (SM) - AREA SOURCES                        00000060
7                                                                                  00000070
8            LANGUAGE: SAS (VERSION 5.08)                                          00000080
9                                                                                  00000090
10           PURPOSE: TO APPLY SPECIATION FACTORS TO THE EMISSION RECORDS          00000100
11                    OUTPUT FROM MDEM AND CREATE SPECIATED EMISSIONS              00000110
12                                                                                 00000120
13           VARIABLE LIST: CONTROL OPTIONS FILE                                   00000130
14                                                                                 00000140
15         NAME        ROUTINE              DESCRIPTION                            00000150
16         ======================================================================00000160
17         TYPE        MAIN        CONTROL OPTIONS RECORD TYPE                     00000170
18         SOURCE      MAIN        EMISSION FILE SOURCE TYPE (AS)                  00000180
19         DETAIL      MAIN        LEVEL OF DETAIL FOR DIAGNOSTIC REPORT           00000190
20         SASMEM      MAIN        SAS MEMBER NAME OF EMISSION FILE                00000200
21         SFFLG       MAIN        FLAG DENOTING PRESENCE OF PSPLIT/SFF FILES      00000210
22         RUN_ID      MAIN        RUN IDENTIFICATION HEADER                       00000220
23         INDX1       MAIN        NUMBER OF TYPE 1 RECORDS                        00000230
24         INDX2       MAIN        NUMBER OF TYPE 2 RECORDS                        00000240
25         MAJCAT1-15  MAIN        VARIABLE NAMES OF MAJOR POLLUTANTS TO BE        00000250
26                                 SPECIATED                                       00000260
27         NUM_SP1-15  MAIN        NUMBER OF SPECIES IN EACH POLLUTANT CATEGORY    00000270
28         NUMSP       MAIN        TOTAL NUMBER OF SPECIES                         00000280
29         PSPLIT      MAIN        NUMBER OF SPECIES IN PSPLIT OUTPUT FILE         00000290
30         SFF         MAIN        NUMBER OF SPECIES IN SFF FILE                   00000300
31                                                                                 00000310
32           VARIABLE LIST: PSPLIT OUTPUT FILE                                     00000320
33                                                                                 00000330
34         NAME        ROUTINE              DESCRIPTION                            00000340
35         ======================================================================00000350
36         TYPE        PSPIN       PSPLIT RECORD GENERAL TYPE (1 OR 2)             00000360
37         TYPES       PSPIN       PSPLIT RECORD SPECIFIC TYPE (11,12,21 OR 22)    00000370
38         CLASS       PSPIN       SAROAD CODE FOR THC OR NOX SUBCLASSES           00000380
39         TSF         PSPIN       SPECIATION FACTOR FOR EACH THC OR NOX SUBCLASS00000390
40         SCC         PSPIN       SCC CODE                                        00000400
41         STATE       PSPIN       STATE CODE                                      00000410
42         COUNTY      PSPIN       COUNTY CODE                                     00000420
43         HCHOWT      PSPIN       HC ADJUSTMENT FOR ALDEHYDE AND METHANE          00000430
44                                                                                 00000440
45           VARIABLE LIST: SPECIATION FACTOR FILE                                 00000450
46                                                                                 00000460
47         NAME        ROUTINE              DESCRIPTION                            00000470
48         ======================================================================00000480
```

```
2  SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS        17:02 WEDNESDAY, JANUARY 4, 1989
49          TYPE         SFFIN       SFF RECORD GENERAL TYPE (1 OR 2)             00000490
50          TYPES        SFFIN       SFF RECORD SPECIFIC TYPE (11,12,21 OR 22)    00000500
51          CLASS        SFFIN       SAROAD CODES FOR SUBCLASSES                  00000510
52          TSF          SFFIN       SPECIATION FACTORS FOR EACH SUBCLASS         00000520
53          SCC          SFFIN       SCC CODE                                     00000530
54          STATE        SFFIN       STATE CODE                                   00000540
55          COUNTY       SFFIN       COUNTY CODE                                  00000550
56                                                                                00000560
57            VARIABLE LIST: ADDITIONS TO EMISSION FILE                           00000570
58                                                                                00000580
59          NAME        ROUTINE               DESCRIPTION                         00000590
60          ==================================================================00000600
61          SE          SORTMER      SPECIATED EMISSIONS (TONS/YR OR MOLES/YR)    00000610
62                                                                                00000620
63            VARIABLE LIST: GENERAL                                              00000630
64                                                                                00000640
65          NAME        ROUTINE               DESCRIPTION                         00000650
66          ==================================================================00000660
67          TM            MAIN       SYSTEM TIME                                  00000670
68          DT            MAIN       SYSTEM DATE                                  00000680
69          _N_          SFFIN       NUMBER OF DATA STEP ITERATIONS               00000690
70          _I_          SFFIN       ARRAY INDEX                                  00000700
71          IN          SORTMER      SAS DATA LIBRARY MEMBER NAME                 00000710
72          IN1         SORTMER      MERGE VARIABLE                               00000720
73          IN2         SORTMER      MERGE VARIABLE                               00000730
74          REPO          MAIN       REPORT DETAIL LABEL                          00000740
75          RUNCOL        MAIN       COLUMN REQUIRED TO CENTER RUN ID             00000750
76          ENDSFF      SORTMER      NUMBER OF LAST SPECIE                        00000760
77          FIRST       SORTMER      SF NUMBER OF FIRST SPECIE WITHIN A MAJOR     00000770
78                                   POLLUTANT CATEGORY                           00000780
79          LAST        SORTMER      SF NUMBER OF LAST SPECIE WITHIN A MAJOR      00000790
80                                   POLLUTANT CATEGORY                           00000800
81          FACTOR      SORTMER      CONVERSION FOR THC EMISSIONS TO KG.          00000810
82          K           SORTMER      ARRAY COUNTER                                00000820
83          ORDER        PSPMER      CODE FOR SPECIE ORDER IN EMISSION FILE       00000830
84          NO           SFFIN       SF NUMBER FOR NO                             00000840
85          NO2          SFFIN       SF NUMBER FOR NO2                            00000850
86          SFF           MAIN       NUMBER OF SPECIES IN SFF FILE                00000860
87          PSPLIT        MAIN       NUMBER OF SPECIES IN PSPLIT FILE             00000870
88          THCNUM       SFFIN       NUMBER OF THC SPECIES                        00000880
89                                                                                00000890
90                                                                                00000900
91            ERROR HANDLING:                                                     00000910
92               ERRORS IN THE CONTROL FILE WILL HALT PROGRAM EXECUTION,          00000920
93               AS WILL INVALID RECORD TYPE CODES IN THE PSPLIT AND SFF          00000930
94               FILES.                                                           00000940
95                                                                                00000950
96            CALLED BY: USER SPECIFIED RUNSTREAM (JCL)                           00000960
97                                                                                00000970
98            METHOD: SM INPUTS AND CHECKS THE CONTROL OPTIONS FILE.  THE         00000980
99                    FILES CONTAINING SPECIATION FACTORS ARE INPUT AND MERGED    00000990
100                   AS SPECIFIED IN THE COF.  THE FACTORS ARE THEN MERGED WITH  00001000
101                   THE EMISSION FILE, MULTIPLIED BY THE MAJOR POLLUTANT        00001010
102                   CATEGORY, AND OUTPUT.  A SUMMARY, EMISSION OR DETAILED      00001020
103                   REPORT IS PRINTED.                                          00001030
104                                                                               00001040
105           PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, AUGUST 1985 00001050
106                                                                               00001060
```

OUTPUT - THC/NO_x FILE

```
3    SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

  UPDATED:    DON NEAL, JULY 1986                                       00001070
                                                                        00001080
  MODIFIED:   LYSA LEBOWITZ, ALLIANCE TECHNOLOGIES CORPORATION,         00001090
              SEPTEMBER 1987                                            00001100
              ROBERT WALTERS, ALLIANCE TECHNOLOGIES                     00001110
              FEBRUARY 1988                                             00001120
                                                                        00001130
*----------------------------------------------------------------------*00001140
;                                                                       00001150
************************************************************************00001160
*****          M A C R O   D E F I N I T I O N S                   *****00001170
************************************************************************00001180
;                                                                       00001190
***** M A C R O   P S P I N                                             00001200
                                                                        00001210
***** READS THE PSPLIT OUTPUT FILE IF INSTRUCTED                        00001220
***** (FIRST ELEMENT OF SFFLG = 'Y')                                    00001230
;                                                                       00001240
%MACRO PSPIN;                                                           00001250
%*;                                                                     00001260
%*---- CALCULATE SPECIES COUNTERS;                                      00001270
%*;                                                                     00001280
  %LET PSPLIT=%EVAL(&PSPLIT);                                           00001290
  %LET NO=%EVAL(&PSPLIT-1);                                             00001300
  %LET NO2=%EVAL(&PSPLIT);                                              00001310
  %LET THCNUM=%EVAL(&PSPLIT-2);                                         00001320
%*;                                                                     00001330
  %IF &SFFLG=YY OR &SFFLG=YN %THEN %DO;                                 00001340
%*;                                                                     00001350
    DATA PSPLIT(DROP=TYPE TYPES); INFILE PSPLIT;                        00001360
       ARRAY CLASS CLASS1-CLASS&PSPLIT;                                 00001370
       ARRAY TSF TSF1-TSF&PSPLIT;                                       00001380
       RETAIN CLASS1-CLASS&PSPLIT TSF1-TSF&PSPLIT HCHOWT;               00001390
%*;                                                                     00001400
%*    INPUT RECORD TYPE                                                 00001410
;                                                                       00001420
       INPUT @114 TYPE 1. @1 @;                                         00001430
%*;                                                                     00001440
%*    BAD PSPLIT RECORD (INVALID RECORD TYPE)                           00001450
;                                                                       00001460
       IF TYPE NE 1 AND TYPE NE 2 THEN DO;                              00001470
          PUT '*** FATAL: BAD PSPLIT RECORD ' TYPE=;                    00001480
          ABORT;                                                        00001490
       END;                                                             00001500
%*;                                                                     00001510
%*    TYPE 1 RECORD (HEADER)                                            00001520
;                                                                       00001530
       IF TYPE=1 THEN DO;                                               00001540
%*;                                                                     00001550
%*--- CHOICE OF LOOP IS DEPENDENT ON &THCNUM;                           00001560
%*;                                                                     00001570
          INPUT @114 TYPES 2. @1 @;                                     00001580
          IF TYPES NE 11 AND TYPES NE 12 THEN DO;                       00001590
             PUT '*** FATAL: BAD PSPLIT HEADER RECORD ' TYPES=;         00001600
             ABORT;                                                     00001610
          END;                                                          00001620
          %IF &THCNUM <= 16 %THEN %DO;                                  00001630
             IF TYPES = 11 THEN DO;                                     00001640
```

```
4     SAS(R) LOG   OS SAS 5.16         MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

                 DO _I_=1 TO &THCNUM;                                   00001650
                    INPUT CLASS 5. @;                                   00001660
                 END;                                                   00001670
                 INPUT;                                                 00001680
                 INPUT;                                                 00001690
              END;                                                      00001700
           %END;                                                        00001710
           %ELSE %DO;                                                   00001720
              IF TYPES = 11 THEN DO;                                    00001730
                 DO _I_=1 TO 16;                                        00001740
                    INPUT CLASS 5. @;                                   00001750
                 END;                                                   00001760
              END;                                                      00001770
              ELSE IF TYPES = 12 THEN DO;                               00001780
                 DO _I_=17 TO &THCNUM;                                  00001790
                    INPUT CLASS 5. @;                                   00001800
                 END;                                                   00001810
                 INPUT;                                                 00001820
              END;                                                      00001830
           %END;                                                        00001840
%*;                                                                     00001850
%*---- NOX SPECIES;                                                     00001860
%*;                                                                     00001870
           CLASS&NO=42601;                                              00001880
           CLASS&NO2=42602;                                             00001890
%*;                                                                     00001900
           RETURN;                                                      00001910
        END /* TYPE 1 */;                                               00001920
%*;                                                                     00001930
%*   TYPE 2 RECORD (SPECIATION FACTORS)                                 00001940
;                                                                       00001950
        IF TYPE=2 THEN DO;                                              00001960
           INPUT @1 STATE 2. @3 COUNTY 4. @14 SCC 8. @;                 00001970
%*;                                                                     00001980
%*--- CHOICE OF LOOP IS DEPENDENT ON &THCNUM;                           00001990
%*;                                                                     00002000
           INPUT @114 TYPES 2. @1 @;                                    00002010
           IF TYPES NE 21 AND TYPES NE 22 THEN DO;                      00002020
              PUT '*** FATAL: BAD PSPLIT SPECIATION RECORD ' TYPES=;    00002030
              ABORT;                                                    00002040
           END;                                                         00002050
           %IF &THCNUM <= 16 %THEN %DO;                                 00002060
              IF TYPES = 21 THEN DO;                                    00002070
                 INPUT @22 @;                                           00002080
                 DO _I_=1 TO &THCNUM;                                   00002090
                    INPUT TSF 5.3 @;                                    00002100
                 END;                                                   00002110
                 INPUT @102 HCHOWT 4.4 TSF&NO 4.3 TSF&NO2 4.3;          00002120
                 INPUT;                                                 00002130
              END;                                                      00002140
           %END;                                                        00002150
           %ELSE %DO;                                                   00002160
              IF TYPES = 21 THEN DO;                                    00002170
                 INPUT @22 @;                                           00002180
                 DO _I_=1 TO 16;                                        00002190
                    INPUT TSF 5.3 @;                                    00002200
                 END;                                                   00002210
                 INPUT @102 HCHOWT 4.4 TSF&NO 4.3 TSF&NO2 4.3;          00002220
```

```
5   SAS(R) LOG   OS SAS 5.16         MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

223                      END;                                                         00002230
224                      ELSE IF TYPES = 22 THEN DO;                                  00002240
225                         INPUT @22 @;                                              00002250
226                         DO _I_=17 TO &THCNUM;                                     00002260
227                            INPUT TSF 5.3 @;                                       00002270
228                         END;                                                      00002280
229                         OUTPUT;                                                   00002290
230                      END;                                                         00002300
231                   %END;                                                           00002310
232                END /* TYPE 2 */;                                                  00002320
233                RETURN;                                                            00002330
234         %*;                                                                       00002340
235         %*---- SORT PSPLIT OUTPUT                                                 00002350
236         ;                                                                         00002360
237             PROC SORT DATA=PSPLIT; BY SCC;                                        00002370
238         %*;                                                                       00002380
239           %END;                                                                   00002390
240         %*;                                                                       00002400
241         %MEND PSPIN;                                                              00002410
242         ;                                                                         00002420
243         *;                                                                        00002430
244         *****  M A C R O   S F F I N                                              00002440
245                                                                                   00002450
246         ***** READS THE SPECIATION FACTOR FILE (SFF) IF INSTRUCTED                00002460
247         ***** (SECOND ELEMENT OF SFFLG = 'Y')                                     00002470
248         ;                                                                         00002480
249         %MACRO SFFIN;                                                             00002490
250         %*;                                                                       00002500
251         %*---- CALCULATE SPECIES COUNTERS;                                        00002510
252         %*;                                                                       00002520
253          %IF &SFF=. %THEN %LET SFF=%EVAL(0);                                      00002530
254          %LET BEGSFF=%EVAL(&PSPLIT+1);                                            00002540
255          %LET ENDSFF=%EVAL(&PSPLIT+&SFF);                                         00002550
256          %IF &SFFLG=YY OR &SFFLG=NY %THEN %DO;                                    00002560
257         %*;                                                                       00002570
258             DATA SFF(DROP=TYPE TYPES); INFILE SFF;                                00002580
259               ARRAY CLASS CLASS&BEGSFF-CLASS&ENDSFF;                              00002590
260               ARRAY TSF TSF&BEGSFF-TSF&ENDSFF;                                    00002600
261               RETAIN CLASS&BEGSFF-CLASS&ENDSFF TSF&BEGSFF-TSF&ENDSFF;             00002610
262         %*;                                                                       00002620
263         %*    INPUT RECORD TYPE                                                   00002630
264         ;                                                                         00002640
265                INPUT @104 TYPE 1. @1 @;                                           00002650
266         %*;                                                                       00002660
267         %*    BAD SFF RECORD (INVALID RECORD TYPE)                                00002670
268         ;                                                                         00002680
269                IF TYPE NE 1 AND TYPE NE 2 THEN DO;                                00002690
270                   PUT '*** FATAL: BAD SFF RECORD ' TYPE=;                         00002700
271                   ABORT;                                                          00002710
272                END;                                                               00002720
273         %*;                                                                       00002730
274         %*    TYPE 1 RECORD (HEADER)                                              00002740
275         ;                                                                         00002750
276                IF TYPE=1 THEN DO;                                                 00002760
277         %*;                                                                       00002770
278         %*--- CHOICE OF LOOP IS DEPENDENT ON &SFF;                                00002780
279         %*;                                                                       00002790
280                   INPUT @104 TYPES 2. @1 @;                                       00002800
```

OUTPUT - THC/NO$_x$ FILE

```
6    SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989
281                  IF TYPES NE 11 AND TYPES NE 12 THEN DO;                        00002810
282                     PUT '*** FATAL: BAD SFF HEADER RECORD ' TYPES=;             00002820
283                     ABORT;                                                      00002830
284                  END;                                                           00002840
285                  %IF &SFF <= 10 %THEN %DO;                                      00002850
286                     IF TYPES = 11 THEN DO;                                      00002860
287                        DO _I_=1 TO &SFF;                                        00002870
288                           INPUT CLASS 7. @;                                     00002880
289                        END;                                                     00002890
290                        INPUT;                                                   00002900
291                        INPUT;                                                   00002910
292                     END;                                                        00002920
293                  %END;                                                          00002930
294                  %ELSE %DO;                                                     00002940
295                     IF TYPES = 11 THEN DO;                                      00002950
296                        DO _I_=1 TO 10;                                          00002960
297                           INPUT CLASS 7. @;                                     00002970
298                        END;                                                     00002980
299                     END;                                                        00002990
300                     ELSE IF TYPES = 12 THEN DO;                                 00003000
301                        DO _I_=11 TO &SFF;                                       00003010
302                           INPUT CLASS 7. @;                                     00003020
303                        END;                                                     00003030
304                        INPUT;                                                   00003040
305                     END;                                                        00003050
306                  %END;                                                          00003060
307        %*;                                                                      00003070
308                  RETURN;                                                        00003080
309               END /* TYPE 1 */;                                                 00003090
310        %*;                                                                      00003100
311        %*   TYPE 2 RECORD (SPECIATION FACTORS)                                  00003110
312        ;                                                                        00003120
313               IF TYPE=2 THEN DO;                                                00003130
314                  INPUT @1 STATE 2. @3 COUNTY 4. @14 SCC 8. @;                   00003140
315        %*;                                                                      00003150
316        %*--- CHOICE OF LOOP IS DEPENDENT ON &SFF;                               00003160
317        %*;                                                                      00003170
318                  INPUT @104 TYPES 2. @1 @;                                      00003180
319                  IF TYPES NE 21 AND TYPES NE 22 THEN DO;                        00003190
320                     PUT '*** FATAL: BAD SFF SPECIATION RECORD ' TYPES=;         00003200
321                     ABORT;                                                      00003210
322                  END;                                                           00003220
323                  %IF &SFF <= 10 %THEN %DO;                                      00003230
324                     IF TYPES = 21 THEN DO;                                      00003240
325                        INPUT @22 @;                                             00003250
326                        DO _I_=1 TO &SFF;                                        00003260
327                           INPUT TSF 8.8 @;                                      00003270
328                        END;                                                     00003280
329                        INPUT;                                                   00003290
330                        INPUT;                                                   00003300
331                     END;                                                        00003310
332                  %END;                                                          00003320
333                  %ELSE %DO;                                                     00003330
334                     IF TYPES = 21 THEN DO;                                      00003340
335                        INPUT @22 @;                                             00003350
336                        DO _I_=1 TO 10;                                          00003360
337                           INPUT TSF 8.8 @;                                      00003370
338                        END;                                                     00003380
```

```
7   SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM      PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

339                     END;                                                00003390
340                     ELSE IF TYPES = 22 THEN DO;                         00003400
341                        INPUT @22 @;                                     00003410
342                        DO _I_=11 TO &SFF;                               00003420
343                           INPUT TSF 8.8 @;                              00003430
344                        END;                                             00003440
345                        OUTPUT;                                          00003450
346                     END;                                                00003460
347                  %END;                                                  00003470
348               END /* TYPE 2 */;                                         00003480
349               RETURN;                                                   00003490
350        %*;                                                              00003500
351        %*---- SORT SFF OUTPUT                                           00003510
352        ;                                                                00003520
353            PROC SORT DATA=SFF; BY SCC;                                  00003530
354        %*;                                                              00003540
355          %END;                                                          00003550
356        %*;                                                              00003560
357        %MEND SFFIN;                                                     00003570
358        ;                                                                00003580
359        *;                                                               00003590
360        *****  M A C R O   P S P M E R                                   00003600
361                                                                         00003610
362        *****  MERGE PSPLIT FILE WITH SFF (IF BOTH EXIST) AND PLACE CLASS   00003620
363               SAROAD CODES INFO A FILE FOR THE REPORT.                  00003630
364        ;                                                                00003640
365        %MACRO PSPMER;                                                   00003650
366        %*;                                                              00003660
367          %LET START=%EVAL(&START);                                      00003670
368          %LET FINISH=%EVAL(&FINISH);                                    00003680
369          DATA SPECIES(KEEP=SCC TSF&START-TSF&FINISH)                    00003690
370               CLASSES(KEEP=CLASS ORDER);                                00003700
371          %IF &SFFLG = YY %THEN %DO;                                     00003710
372             MERGE PSPLIT(IN=IN1) SFF;                                   00003720
373             BY SCC;                                                     00003730
374             IF IN1;                                                     00003740
375          %END;                                                          00003750
376          %ELSE %IF &SFFLG = YN %THEN %DO;                               00003760
377             SET PSPLIT;                                                 00003770
378          %END;                                                          00003780
379          %ELSE %IF &SFFLG = NY %THEN %DO;                               00003790
380             SET SFF;                                                    00003800
381          %END;                                                          00003810
382          ARRAY SFCLASS CLASS&START-CLASS&FINISH;                        00003820
383        %*;                                                              00003830
384        %*---- IF FIRST PASS, CREATE CLASS DATA;                         00003840
385        %*;                                                              00003850
386          IF _N_=1 THEN DO;                                              00003860
387             ORDER=&START-1;                                             00003870
388             DO OVER SFCLASS;                                            00003880
389                ORDER+1;                                                 00003890
390                CLASS=SFCLASS;                                           00003900
391                OUTPUT CLASSES;                                          00003910
392             END;                                                        00003920
393          END;                                                           00003930
394        %*;                                                              00003940
395        %*---- OUTPUT MERGED SPECIATION RECORDS;                         00003950
396        %*;                                                              00003960
```

```
8    SAS(R) LOG   OS SAS 5.16        MVS/XA JOB xxxSPMA  STEP SM      PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

397          OUTPUT SPECIES;                                                     00003970
398        %*;                                                                   00003980
399        %MEND PSPMER;                                                         00003990
400        ;                                                                     00004000
401        *;                                                                    00004010
402        *****  M A C R O   T I M E Z O N E                                    00004020
403                                                                              00004030
404        *****  APPLY TIMEZONE DATA TO EMISSION FILE                           00004040
405        ;                                                                     00004050
406        %MACRO TIMEZONE;                                                      00004060
407        %*;                                                                   00004070
408        %*---- INPUT AND SORT THE TIMEZONE FILE;                              00004080
409        %*;                                                                   00004090
410          DATA TIMEZONE; INFILE TZF;                                          00004100
411            INPUT @1 STATE 2. COUNTY 4. ZONE 1. DAYLITE 1.;                   00004110
412        %*;                                                                   00004120
413        %*     ADJUST TO GMT;                                                 00004130
414        %*;                                                                   00004140
415            ZONE=ZONE+4;                                                      00004150
416        %*;                                                                   00004160
417          PROC SORT DATA=TIMEZONE;                                            00004170
418            BY STATE COUNTY;                                                  00004180
419        %*;                                                                   00004190
420        %*---- SORT EMISSION FILE;                                            00004200
421        %*;                                                                   00004210
422          PROC SORT DATA=INFILE.&SASMEM OUT=SORTOUT;                          00004220
423            BY STATE COUNTY;                                                  00004230
424        %*;                                                                   00004240
425        %*---- MERGE TZF WITH EMISSIONS;                                      00004250
426        %*;                                                                   00004260
427          DATA TZFOUT ORPHAN.NOTIME;                                          00004270
428            MERGE SORTOUT(IN=INA) TIMEZONE;                                   00004280
429            BY STATE COUNTY;                                                  00004290
430            IF INA;                                                           00004300
431            IF ZONE=. THEN OUTPUT ORPHAN.NOTIME;                              00004310
432            ELSE OUTPUT TZFOUT;                                               00004320
433        %*;                                                                   00004330
434        %*---- RESORT EMISSIONS TO PREPARE FOR SF MERGE;                      00004340
435        %*;                                                                   00004350
436          PROC SORT DATA=TZFOUT;                                              00004360
437            BY SCC STATE COUNTY;                                              00004370
438        %*;                                                                   00004380
439        %MEND TIMEZONE;                                                       00004390
440        ;                                                                     00004400
441        *;                                                                    00004410
442        *****  M A C R O   S O R T M E R                                      00004420
443                                                                              00004430
444        *****  MERGE EMISSION FILE WITH SPECIES FILE. MULTIPLY FACTORS BY     00004440
445               ANNUAL POLLUTANTS. OUTPUT RECORDS WITHOUT SPECIATION FACTORS   00004450
446               TO ORPHAN FILE.                                                00004460
447        ;                                                                     00004470
448        %MACRO SORTMER;                                                       00004480
449        %*;                                                                   00004490
450        %*---- CREATE MACRO VARIABLES FOR MAJOR POLLUTANT NAMES AND NUMBERS;  00004500
451        %*;                                                                   00004510
452          DATA _NULL_;SET ONE;                                                00004520
453            %LET INDX2=%EVAL(&INDX2);                                         00004530
454            %LET START=%EVAL(&START);                                         00004540
```

```
9   SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS      17:02 WEDNESDAY, JANUARY 4, 1989

455            %LET FINISH=%EVAL(&FINISH);                                00004550
456            %DO K=1 %TO &INDX2;                                        00004560
457               CALL SYMPUT("MAJCAT&K",MAJCAT&K);                       00004570
458               CALL SYMPUT("NUM_SP&K",NUM_SP&K);                       00004580
459            %END;                                                      00004590
460            RUN;                                                       00004600
461        %*;                                                            00004610
462        %*---- PERFORM MERGE;                                          00004620
463        %*;                                                            00004630
464          DATA SMOUT.&SASMEM(DROP=TSF&START-TSF&FINISH)                00004640
465               ORPHAN.NOSPEC(DROP=SE&START-SE&FINISH TSF&START-TSF&FINISH); 00004650
466          MERGE SPECIES(IN=IN2) TZFOUT(IN=IN1);                        00004660
467            BY SCC;                                                    00004670
468            ARRAY SE SE&START-SE&FINISH;                               00004680
469            ARRAY TSF TSF&START-TSF&FINISH;                            00004690
470        %*;                                                            00004700
471        %*---- IF EMISSIONS AND SPECIES PRESENT, MULTIPLY EMISSIONS AND OUTPUT. 00004710
472        %*;                                                            00004720
473            IF IN1 AND IN2 THEN DO;                                    00004730
474        %*;                                                            00004740
475        %*---- SELECT FIRST AND LAST MAJCAT BASED ON PSP/SFF FLAGS;    00004750
476        %*;                                                            00004760
477               %IF &SFFLG=YY OR &SFFLG=YN %THEN %LET X=%EVAL(1);       00004770
478                  %ELSE %LET X=%EVAL(3);                               00004780
479               %IF &SFFLG=YY OR &SFFLG=NY %THEN %LET Y=%EVAL(&INDX2);  00004790
480                  %ELSE %LET Y=%EVAL(2);                               00004800
481        %*;                                                            00004810
482        %*---- REPEAT FOR EACH MAJCAT (IF FIRST MAJ_CAT, CONVERT TONS TO KG); 00004820
483        %*;                                                            00004830
484               %LET FIRST=%EVAL(1);                                    00004840
485               %DO K=&X %TO &Y;                                        00004850
486                  %IF &K=1 %THEN %LET FACTOR=907.18474;                00004860
487                  %ELSE %LET FACTOR=1;                                 00004870
488                  %LET LAST=%EVAL(&FIRST+&&NUM_SP&K.-1);               00004880
489                  DO _I_=&FIRST TO &LAST;                              00004890
490                     SE=TSF*&&MAJCAT&K*&FACTOR;                        00004900
491                  END;                                                 00004910
492                  %LET FIRST=%EVAL(&LAST+1);                           00004920
493               %END;                                                   00004930
494        %*;                                                            00004940
495               OUTPUT SMOUT.&SASMEM;                                   00004950
496            END;                                                       00004960
497        %*;                                                            00004970
498        %*---- IF NO SPECIES ARE MERGED TO EMISSIONS RECORD, OUTPUT TO ORPHAN; 00004980
499        %*;                                                            00004990
500            ELSE IF IN1 THEN DO;                                       00005000
501               OUTPUT ORPHAN.NOSPEC;                                   00005010
502            END;                                                       00005020
503        %*;                                                            00005030
504        %MEND SORTMER;                                                 00005040
505        *;                                                             00005050
506        *;                                                             00005060
507        *****  M A C R O   D E T A I L                                 00005070
508                                                                       00005080
509        *****  PRINT OUT DETAILED REPORT                               00005090
510        ;                                                              00005100
511        %MACRO DETAIL;                                                 00005110
512        %*;                                                            00005120
```

OUTPUT - THC/NO$_x$ FILE

```
10    SAS(R) LOG    OS SAS 5.16         MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

513          %*---- PRINT RECORDS WITHOUT NO TIMEZONE DATA;                          00005130
514          %*;                                                                     00005140
515            PROC PRINT DATA=ORPHAN.NOTIME;                                        00005150
516              VAR SCC STATE COUNTY;                                               00005160
517              TITLE 'EMISSION RECORDS WITH NO TIME ZONE DATA';                    00005170
518          %*;                                                                     00005180
519          %*---- PRINT NOSPEC (NO MATCH IN SPECIATION FILE)                       00005190
520          ;                                                                       00005200
521            PROC PRINT DATA=ORPHAN.NOSPEC;                                        00005210
522              VAR SCC STATE COUNTY;                                               00005220
523              TITLE 'EMISSION RECORDS WITH NO SPECIATION PROFILE';                00005230
524              FORMAT SCC Z8. STATE Z2. COUNTY Z4.;                                00005240
525          %*;                                                                     00005250
526          %*---- PRODUCE SUMS IF REQUESTED;                                       00005260
527          %*;                                                                     00005270
528            %LET START=%EVAL(&START);                                             00005280
529            %LET FINISH=%EVAL(&FINISH);                                           00005290
530            %IF &DETAIL=T OR &DETAIL=D %THEN %DO;                                 00005300
531              PROC MEANS MAXDEC=0 SUM DATA=SMOUT.&SASMEM;                         00005310
532              VAR SE&START-SE&FINISH;                                             00005320
533              TITLE 'ANNUAL TOTALS OF SPECIATED EMISSIONS';                       00005330
534            %END;                                                                 00005340
535          %*;                                                                     00005350
536          %*--- CHECK COF FOR DETAIL                                              00005360
537          ;                                                                       00005370
538            %IF &DETAIL=D %THEN %DO;                                              00005380
539              PROC PRINT DATA=SMOUT.&SASMEM(OBS=200);                             00005390
540              ID SCC STATE COUNTY;                                                00005400
541              VAR SE&START-SE&FINISH;                                             00005410
542              FORMAT SCC Z8. STATE Z2. COUNTY Z4.;                                00005420
543              TITLE 'APPLIED SPECIATION FACTORS';                                 00005430
544              TITLE2 '(FIRST 200 OBSERVATIONS)';                                  00005440
545            %END;                                                                 00005450
546          %*;                                                                     00005460
547          %MEND DETAIL;                                                           00005470
548          *;                                                                      00005480
549          ************************************************************************00005490
550          *****        E N D   M A C R O   D E F I N I T I O N S            *****00005500
551          ************************************************************************00005510
552          ;                                                                       00005520
553          ********************                                                    00005530
554          * MAIN PROGRAM: SM *                                                    00005540
555          ********************                                                    00005550
556                                                                                  00005560
557          ***** THIS PROGRAM WILL:                                                00005570
558                              1. READ THE CONTROL OPTIONS FILE                    00005580
559                              2. READ THE PSPLIT OUTPUT FILE (IF SO INSTRUCTED)   00005590
560                              3. READ THE SFF FILE (IF SO INSTRUCTED)             00005600
561                              4. MERGE 2. AND 3.                                  00005610
562                              5. SORT EMISSION FILE AND APPLY TIMEZONE DATA       00005620
563                              6. MERGE EMISSION FILE WITH SPECIATION FILE         00005630
564                              7. MULTIPLY SPECIES FACTORS BY ANNUAL EMISSIONS     00005640
565                              8. PRODUCE A DIAGNOSTIC REPORT                      00005650
566          ;                                                                       00005660
567          ***** 1 -- READ THE CONTROL OPTIONS FILE                                00005670
568          ;                                                                       00005680
569          *---- OPEN FILES AND DEFINE ARRAYS                                      00005690
570          ;                                                                       00005700
```

```
11   SAS(R) LOG   OS SAS 5.16        MVS/XA JOB xxxSPMA  STEP SM      PROC SAS    17:02 WEDNESDAY, JANUARY 4, 1989

571        DATA ONE(DROP=TYPE); INFILE COF EOF=WRITE;                             00005710
572          ARRAY MAJCAT $ 8 MAJCAT1-MAJCAT15;                                   00005720
573          ARRAY NUM_SP NUM_SP1-NUM_SP15;                                       00005730
574          RETAIN SCE DETAIL SASMEM SFFLG MAJCAT1-MAJCAT15 NUM_SP1-NUM_SP15     00005740
575              NUMSP RUN_ID INDX2;                                              00005750
576          START=0;                                                             00005760
577          FINISH=0;                                                            00005770
578          INPUT @1 TYPE 1. @;                                                  00005780
579        *;                                                                     00005790
580        *---- INVALID CONTROL RECORD (TYPE NOT 1 OR 2)                         00005800
581        ;                                                                      00005810
582          IF TYPE NE 1 AND TYPE NE 2 THEN DO;                                  00005820
583             PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;                   00005830
584             ABORT;                                                            00005840
585          END;                                                                 00005850
586        *;                                                                     00005860
587        *---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION)                       00005870
588        ;                                                                      00005880
589          IF TYPE=1 THEN DO;                                                   00005890
590        *;                                                                     00005900
591        *     CHECK FOR TOO MANY TYPE 1 RECORDS.                               00005910
592        ;                                                                      00005920
593            INDX1+1;                                                           00005930
594            IF INDX1>1 THEN DO;                                                00005940
595              PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN CONTROL FILE';    00005950
596              ABORT;                                                           00005960
597            END;                                                               00005970
598        *;                                                                     00005980
599        *     INPUT AND CHECK DATA                                             00005990
600        ;                                                                      00006000
601            INPUT @3 SCE $2. @6 DETAIL $1. @8 SASMEM $8. @17 SFFLG $2.         00006010
602               @20 RUN_ID $56.;                                                00006020
603            IF SCE NE 'AS' THEN DO;                                            00006030
604              PUT '*** FATAL: INVALID SOURCE TYPE ' SCE=;                      00006040
605              ABORT;                                                           00006050
606            END;                                                               00006060
607            IF DETAIL NE 'D' AND DETAIL NE 'S' AND DETAIL NE 'T' THEN DO;      00006070
608              PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT ' DETAIL=;  00006080
609              ABORT;                                                           00006090
610            END;                                                               00006100
611            IF SFFLG NE 'YY' AND SFFLG NE 'YN' AND SFFLG NE 'NY' THEN DO;      00006110
612              PUT '*** FATAL: INVALID SPECIATION FLAGS SPECIFIED ' SFFLG=;     00006120
613              ABORT;                                                           00006130
614            END;                                                               00006140
615            RETURN;                                                            00006150
616          END;                                                                 00006160
617        *;                                                                     00006170
618        *---- TYPE 2 CONTROL RECORD (SPECIATION FILE FORMAT).                  00006180
619        ;                                                                      00006190
620          IF TYPE=2 THEN DO;                                                   00006200
621        *;                                                                     00006210
622        *     CHECK FOR TOO MANY TYPE 2 RECORDS                                00006220
623        ;                                                                      00006230
624            INDX2+1;                                                           00006240
625            IF INDX2>15 THEN DO;                                               00006250
626              PUT '*** FATAL: TOO MANY POLLUTANT CLASSES SPECIFIED';           00006260
627              ABORT;                                                           00006270
628            END;                                                               00006280
```

```
12    SAS(R) LOG    OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM        PROC SAS      17:02 WEDNESDAY, JANUARY 4, 1989

629          *;                                                                        00006290
630          *     INPUT AND CHECK DATA                                                00006300
631          ;                                                                         00006310
632              _I_=INDX2;                                                            00006320
633              INPUT @3 MAJCAT $8. @12 NUM_SP 2.;                                    00006330
634          *;                                                                        00006340
635          *---- ATHC MUST BE FIRST;                                                 00006350
636          *;                                                                        00006360
637              IF _I_=1 AND MAJCAT NE 'ATHC' THEN DO;                                00006370
638                PUT '*** FATAL: THC IS NOT FIRST CATEGORY IN CONTROL FILE';         00006380
639                ABORT;                                                              00006390
640              END;                                                                  00006400
641          *;                                                                        00006410
642          *---- ANOX MUST BE SECOND;                                                00006420
643          *;                                                                        00006430
644              IF _I_=2 AND MAJCAT NE 'ANOX' THEN DO;                                00006440
645                PUT '*** FATAL: NOX IS NOT SECOND CATEGORY IN CONTROL FILE';        00006450
646                ABORT;                                                              00006460
647              END;                                                                  00006470
648          *;                                                                        00006480
649              IF NUM_SP>32 THEN DO;                                                 00006490
650                PUT '*** FATAL: GREATER THAN 32 SUBCLASSES SPECIFIED';              00006500
651                ABORT;                                                              00006510
652              END;                                                                  00006520
653              NUMSP+NUM_SP;                                                         00006530
654              RETURN;                                                               00006540
655            END;                                                                    00006550
656          *;                                                                        00006560
657          *---- BEFORE OUTPUT, CREATE COUNTERS FOR PSPLIT AND SFF FILES;            00006570
658          *---- AS WELL AS ARRAY START AND FINISH POINTS BASED ON FLAGS;            00006580
659          *;                                                                        00006590
660          WRITE: SFF=SUM(OF NUM_SP3-NUM_SP15);                                      00006600
661                 PSPLIT=SUM(NUM_SP1,NUM_SP2);                                       00006610
662                 IF SFFLG='YY' OR SFFLG='YN' THEN START=1;                          00006620
663                    ELSE START=(PSPLIT+1);                                          00006630
664                 IF SFFLG='YY' OR SFFLG='NY' THEN FINISH=NUMSP;                     00006640
665                    ELSE FINISH=PSPLIT;                                             00006650
666          *;                                                                        00006660
667          *---- CHECK IF SPECIATION SPECIFIED;                                      00006670
668          *;                                                                        00006680
669            IF NUMSP=. THEN DO;                                                     00006690
670              PUT '*** FATAL: NO SPECIATION REQUESTED IN CONTROL FILE';             00006700
671              ABORT;                                                                00006710
672            END;                                                                    00006720
673          *;                                                                        00006730
674            OUTPUT;                                                                 00006740
675          *;                                                                        00006750
676          *---- CREATE MACRO VARIABLES FROM CONTROL OPTIONS FILE;                   00006760
677          *;                                                                        00006770
678            CALL SYMPUT('PSPLIT',PSPLIT);                                           00006780
679            CALL SYMPUT('SFF',SFF);                                                 00006790
680            CALL SYMPUT('SFFLG',SFFLG);                                             00006800
681            CALL SYMPUT('SASMEM',SASMEM);                                           00006810
682            CALL SYMPUT('INDX2',INDX2);                                             00006820
683            CALL SYMPUT('DETAIL',DETAIL);                                           00006830
684            CALL SYMPUT('NUMSP',NUMSP);                                             00006840
685            CALL SYMPUT('START',START);                                             00006850
686            CALL SYMPUT('FINISH',FINISH);                                           00006860
```

```
13     SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS   17:02 WEDNESDAY, JANUARY 4, 1989

687          RUN;                                                     00006870

NOTE: NUMERIC VALUES HAVE BEEN CONVERTED TO CHARACTER
      VALUES AT THE PLACES GIVEN BY: (LINE):(COLUMN).
      678:24  679:21  682:23  684:23  685:23  686:24

NOTE: INFILE COF IS:
      DSNAME=xxxaaaa.FREDS85.SPM.AS.USA.THC.COF,
      UNIT=DISK,VOL=SER=USR185,DISP=SHR,
      DCB=(BLKSIZE=4240,LRECL=80,RECFM=FB)
NOTE: 4 LINES WERE READ FROM INFILE COF.
NOTE: DATA SET WORK.ONE HAS 1 OBSERVATIONS AND 42 VARIABLES. 126 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.32 SECONDS AND 264K.

688          DATA ONE; SET ONE;                                       00006880
689        *;                                                         00006890
690        ***** 2 -- READ THE PSPLIT FILE IF SO INSTRUCTED IN THE COF 00006900
691        ;                                                          00006910
692              %PSPIN                                               00006920
693        + DATA PSPLIT(                                                       1-%pspin

NOTE: DATA SET WORK.ONE HAS 1 OBSERVATIONS AND 42 VARIABLES. 126 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 148K.

694        +DROP=TYPE TYPES);                                                   1-%pspin
695        + INFILE PSPLIT;                                                     1-%pspin
696        + ARRAY CLASS CLASS1-CLASS34;                                        1-%pspin
697        + ARRAY TSF TSF1-TSF34;                                              1-%pspin
698        + RETAIN CLASS1-CLASS34 TSF1-TSF34 HCHOWT;                           1-%pspin
699        + INPUT @114 TYPE 1. @1 @;                                           1-%pspin
700        + IF TYPE NE 1 AND TYPE NE 2 THEN DO;                                1-%pspin
701        + PUT '*** FATAL: BAD PSPLIT RECORD ' TYPE=;                         1-%pspin
702        + ABORT;                                                             1-%pspin
703        + END;                                                               1-%pspin
704        + IF TYPE=1 THEN DO;                                                 1-%pspin
705        + INPUT @114 TYPES 2. @1 @;                                          1-%pspin
706        + IF TYPES NE 11 AND TYPES NE 12 THEN DO;                            1-%pspin
707        + PUT '*** FATAL: BAD PSPLIT HEADER RECORD ' TYPES=;                 1-%pspin
708        + ABORT;                                                             1-%pspin
709        + END;                                                               1-%pspin
710        + IF TYPES = 11 THEN DO;                                             1-%pspin
711        + DO _I_=1 TO 16;                                                    1-%pspin
712        + INPUT CLASS 5. @;                                                  1-%pspin
713        + END;                                                               1-%pspin
714        + END;                                                               1-%pspin
715        + ELSE IF TYPES = 12 THEN DO;                                        1-%pspin
716        + DO _I_=17 TO 32;                                                   1-%pspin
717        + INPUT CLASS 5. @;                                                  1-%pspin
718        + END;                                                               1-%pspin
```

OUTPUT - THC/NO$_x$ FILE   Page 19 of 29

```
14    SAS(R) LOG   OS SAS 5.16         MVS/XA JOB xxxSPMA  STEP SM        PROC SAS    17:02 WEDNESDAY, JANUARY 4, 1989

719         + INPUT;                                                                  1-%pspin
720         + END;                                                                    1-%pspin
721         + CLASS33=42601;                                                          1-%pspin
722         + CLASS34=42602;                                                          1-%pspin
723         + RETURN;                                                                 1-%pspin
724         + END ;                                                                   1-%pspin
725         + IF TYPE=2 THEN DO;                                                      1-%pspin
726         + INPUT @1 STATE 2. @3 COUNTY 4. @14 SCC 8. @;                            1-%pspin
727         + INPUT @114 TYPES 2. @1 @;                                               1-%pspin
728         + IF TYPES NE 21 AND TYPES NE 22 THEN DO;                                 1-%pspin
729         + PUT '*** FATAL: BAD PSPLIT SPECIATION RECORD ' TYPES=;                  1-%pspin
730         + ABORT;                                                                  1-%pspin
731         + END;                                                                    1-%pspin
732         + IF TYPES = 21 THEN DO;                                                  1-%pspin
733         + INPUT @22 @;                                                            1-%pspin
734         + DO _I_=1 TO 16;                                                         1-%pspin
735         + INPUT TSF 5.3 @;                                                        1-%pspin
736         + END;                                                                    1-%pspin
737         + INPUT @102 HCHOWT 4.4 TSF33 4.3 TSF34 4.3;                              1-%pspin
738         + END;                                                                    1-%pspin
739         + ELSE IF TYPES = 22 THEN DO;                                             1-%pspin
740         + INPUT @22 @;                                                            1-%pspin
741         + DO _I_=17 TO 32;                                                        1-%pspin
742         + INPUT TSF 5.3 @;                                                        1-%pspin
743         + END;                                                                    1-%pspin
744         + OUTPUT;                                                                 1-%pspin
745         + END;                                                                    1-%pspin
746         + END ;                                                                   1-%pspin
747         + RETURN;                                                                 1-%pspin
748         + PROC SORT DATA                                                          1-%pspin

NOTE: INFILE PSPLIT IS:
      DSNAME=xxxaaaa.FREDS85.SPM.AP.USA.PSPLIT.EBCDAT,
      UNIT=DISK,VOL=SER=USR069,DISP=SHR,
      DCB=(BLKSIZE=1150,LRECL=115,RECFM=FB)
NOTE: 6946 LINES WERE READ FROM INFILE PSPLIT.
NOTE: DATA SET WORK.PSPLIT HAS 3472 OBSERVATIONS AND 72 VARIABLES. 80 OBS/TRK.
NOTE: THE DATA STATEMENT USED 1.94 SECONDS AND 160K.

749         +=PSPLIT;                                                                 1-%pspin
750         + BY SCC;                                                                 1-%pspin
752          *;                                                         00006930
753          ***** 3 -- READ THE SFF FILE IF SO INSTRUCTED IN THE COF       00006940
754          ;                                                          00006950
755                %SFFIN                                               00006960
758          *;                                                         00006970
759          ***** 4 -- MERGE THE PSPLIT AND SFF FILES IF BOTH EXIST        00006980
760          ;                                                          00006990
761                %PSPMER                                              00007000
762         + DATA SPECIES(                                                           1-%pspmer

NOTE: DATA SET WORK.PSPLIT HAS 3472 OBSERVATIONS AND 72 VARIABLES. 80 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.39 SECONDS AND 204K.

763         +KEEP=SCC TSF1-TSF34) CLASSES(KEEP=CLASS ORDER);                          1-%pspmer
764         + SET PSPLIT;                                                             1-%pspmer
```

OUTPUT - THC/NO$_x$ FILE

```
15    SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

765        + ARRAY SFCLASS CLASS1-CLASS34;                                                     1-%pspmer
766        + IF _N_=1 THEN DO;                                                                 1-%pspmer
767        + ORDER=1-1;                                                                        1-%pspmer
768        + DO OVER SFCLASS;                                                                  1-%pspmer
769        + ORDER+1;                                                                          1-%pspmer
770        + CLASS=SFCLASS;                                                                    1-%pspmer
771        + OUTPUT CLASSES;                                                                   1-%pspmer
772        + END;                                                                              1-%pspmer
773        + END;                                                                              1-%pspmer
774        + OUTPUT SPECIES;                                                                   1-%pspmer
776          *;                                                                00007010
777          ***** 5 -- SORT EMISSION FILE AND APPLY TIMEZONE DATA                 00007020
778          ;                                                                 00007030
779               %TIMEZONE                                                    00007040
780        + DATA TIMEZONE;                                                                    1-%timezone

NOTE: DATA SET WORK.SPECIES HAS 3472 OBSERVATIONS AND 35 VARIABLES. 164 OBS/TRK.
NOTE: DATA SET WORK.CLASSES HAS 34 OBSERVATIONS AND 2 VARIABLES. 2346 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.25 SECONDS AND 176K.

781        + INFILE TZF;                                                                       1-%timezone
782        + INPUT @1 STATE 2. COUNTY 4. ZONE 1. DAYLITE 1.;                                   1-%timezone
783        + ZONE=ZONE+4;                                                                      1-%timezone
784        + PROC SORT DATA                                                                    1-%timezone

NOTE: INFILE TZF IS:
      DSNAME=xxxaaaa.FREDS85.TZF.USA.EBCDAT,
      UNIT=DISK,VOL=SER=USR067,DISP=SHR,
      DCB=(BLKSIZE=3040,LRECL=95,RECFM=FB)
NOTE: 3088 LINES WERE READ FROM INFILE TZF.
NOTE: DATA SET WORK.TIMEZONE HAS 3088 OBSERVATIONS AND 4 VARIABLES. 1304 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.19 SECONDS AND 160K.

785        +=TIMEZONE;                                                                         1-%timezone
786        + BY STATE COUNTY;                                                                  1-%timezone
787        + PROC SORT DATA                                                                    1-%timezone

NOTE: DATA SET WORK.TIMEZONE HAS 3088 OBSERVATIONS AND 4 VARIABLES. 1304 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.19 SECONDS AND 200K.

788        +=INFILE.DATA OUT=SORTOUT;                                                          1-%timezone
789        + BY STATE COUNTY;                                                                  1-%timezone
790        + DATA TZFOUT ORPHAN                                                                1-%timezone

NOTE: DATA SET WORK.SORTOUT HAS 132884 OBSERVATIONS AND 6 VARIABLES. 1234 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 5.42 SECONDS AND 644K.

791        +.NOTIME;                                                                           1-%timezone
792        + MERGE SORTOUT(IN=INA) TIMEZONE;                                                   1-%timezone
793        + BY STATE COUNTY;                                                                  1-%timezone
794        + IF INA;                                                                           1-%timezone
795        + IF ZONE=. THEN OUTPUT ORPHAN.NOTIME;                                              1-%timezone
796        + ELSE OUTPUT TZFOUT;                                                               1-%timezone
797        + PROC SORT DATA                                                                    1-%timezone

NOTE: DATA SET WORK.TZFOUT HAS 132884 OBSERVATIONS AND 8 VARIABLES. 868 OBS/TRK.
```

```
16   SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

NOTE: DATA SET ORPHAN.NOTIME HAS 0 OBSERVATIONS AND 8 VARIABLES. 868 OBS/TRK.
NOTE: THE DATA STATEMENT USED 7.38 SECONDS AND 228K.

798        +=TZFOUT;                                                              1-%timezone
799        + BY SCC STATE COUNTY;                                                 1-%timezone
801         *;                                                           00007050
802         ***** 6 -- MERGE EMISSION FILE WITH SPECIATION FILE          00007060
803         ***** 7 -- MULTIPLY SPECIATION FACTORS BY ANNUAL EMISSIONS   00007070
804         ;                                                            00007080
805               %SORTMER                                               00007090
806        + DATA _NULL_;                                                         1-%sortmer

NOTE: DATA SET WORK.TZFOUT HAS 132884 OBSERVATIONS AND 8 VARIABLES. 868 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 6.07 SECONDS AND 632K.

807        +SET ONE;                                                              1-%sortmer
808        + CALL SYMPUT("MAJCAT1",MAJCAT1);                                      1-%sortmer
809        + CALL SYMPUT("NUM_SP1",NUM_SP1);                                      1-%sortmer
810        + CALL SYMPUT("MAJCAT2",MAJCAT2);                                      1-%sortmer
811        + CALL SYMPUT("NUM_SP2",NUM_SP2);                                      1-%sortmer
812        + CALL SYMPUT("MAJCAT3",MAJCAT3);                                      1-%sortmer
813        + CALL SYMPUT("NUM_SP3",NUM_SP3);                                      1-%sortmer
814        + RUN;                                                                 1-%sortmer

NOTE: NUMERIC VALUES HAVE BEEN CONVERTED TO CHARACTER
      VALUES AT THE PLACES GIVEN BY: (LINE):(COLUMN).
      809:24  811:24  813:24

NOTE: THE DATA STATEMENT USED 0.06 SECONDS AND 144K.

815        + DATA SMOUT.DATA (DROP=TSF1-TSF34) ORPHAN.NOSPEC(DROP=SE1-SE34 TSF1-TSF34);   1-%sortmer
816        + MERGE SPECIES(IN=IN2) TZFOUT(IN=IN1);                                1-%sortmer
817        + BY SCC;                                                              1-%sortmer
818        + ARRAY SE SE1-SE34;                                                   1-%sortmer
819        + ARRAY TSF TSF1-TSF34;                                                1-%sortmer
820        + IF IN1 AND IN2 THEN DO;                                              1-%sortmer
821        + DO _I_=1 TO 32;                                                      1-%sortmer
822        + SE=TSF*ATHC *907.18474;                                              1-%sortmer
823        + END;                                                                 1-%sortmer
824        + DO _I_=33 TO 34;                                                     1-%sortmer
825        + SE=TSF*ANOX *1;                                                      1-%sortmer
826        + END;                                                                 1-%sortmer
827        + OUTPUT SMOUT.DATA ;                                                  1-%sortmer
828        + END;                                                                 1-%sortmer
829        + ELSE IF IN1 THEN DO;                                                 1-%sortmer
830        + OUTPUT ORPHAN.NOSPEC;                                                1-%sortmer
831        + END;                                                                 1-%sortmer
833         *;                                                           00007100
834         ***** 8 -- WRITE DIAGNOSTIC REPORT                           00007110
835         ;                                                            00007120
836         *---- DEFINE FILE, ASSIGN ARRAY AND INITIALIZE VARIABLES     00007130
837         ;                                                            00007140
838                                                                      00007150

NOTE: MISSING VALUES WERE GENERATED AS A RESULT OF PERFORMING
      AN OPERATION ON MISSING VALUES.
      EACH PLACE IS GIVEN BY: (NUMBER OF TIMES) AT (LINE):(COLUMN).
```

```
17   SAS(R) LOG   OS SAS 5.16           MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

      >32767 AT 825:5
NOTE: DATA SET SMOUT.DATA HAS 132884 OBSERVATIONS AND 42 VARIABLES.
NOTE: DATA SET ORPHAN.NOSPEC HAS 0 OBSERVATIONS AND 8 VARIABLES. 808 OBS/TRK.
NOTE: THE DATA STATEMENT USED 25.41 SECONDS AND 236K.

838          DATA _NULL_; SET ONE;                                                00007150
839            ARRAY MAJCAT $ 8 MAJCAT1-MAJCAT15;                                 00007160
840            ARRAY NUM_SP NUM_SP1-NUM_SP15;                                     00007170
841            FILE PRINT NOTITLES;                                               00007180
842            IF DETAIL='S' THEN REPO=' SUMMARY';                                00007190
843                ELSE IF DETAIL='T' THEN REPO='   TOTALS';                      00007200
844                ELSE REPO='DETAILED';                                          00007210
845            DT=DATE();TM=TIME();                                               00007220
846            RUNCOL=66-LENGTH(RUN_ID)/2;                                        00007230
847        *;                                                                     00007240
848        *---- PRINT HEADER                                                     00007250
849        ;                                                                      00007260
850          PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//            00007270
851              @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'             00007280
852              @110 'SPECIATION MODULE (SM)'//@2 'DIAGNOSTIC REPORT'            00007290
853              @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56           00007300
854              'CONTROL FILE LISTING' @77 55*'-'//;                             00007310
855        *;                                                                     00007320
856        *---- PRINT TYPE 1 RECORD                                              00007330
857        ;                                                                      00007340
858          PUT @2 'RUN IDENTIFICATION RECORD:'//@5 'SOURCE: ' SCE ' DETAIL: '   00007350
859              DETAIL ' SAS FILE: ' SASMEM ' PSPLIT,SFF FLAGS: 'SFFLG ' RUN ID: '00007360
860              RUN_ID///;                                                       00007370
861        *;                                                                     00007380
862        *---- PRINT TYPE 2 RECORDS                                             00007390
863        ;                                                                      00007400
864          IF INDX2>0 THEN DO;                                                  00007410
865            PUT @2 'POLLUTANT SPECIES DEFINITION RECORDS:'//                   00007420
866                @51 '            MAJOR     # OF'/                              00007430
867                @51 'RECORD #  POLLUTANT   SPECIES'/                           00007440
868                @51 '------------------------------'/;                         00007450
869            DO _I_=1 TO INDX2;                                                 00007460
870              PUT @53 _I_ 2. @61 MAJCAT $8. @75 NUM_SP 2./;                    00007470
871            END;                                                               00007480
872            PUT @51 '----------------------------- '/_PAGE_;                   00007490
873          END;                                                                 00007500
874        *;                                                                     00007510
875        *---- PRINT SF IDENTITY USING SAROAD DESCRIPTIONS IN SAROAD FILE;      00007520
876        *;                                                                     00007530
877                                                                               00007540

NOTE: 16 LINES WERE WRITTEN TO FILE PRINT.
NOTE: THE DATA STATEMENT USED 0.08 SECONDS AND 156K.

877          DATA SAROAD; INFILE SAROAD;                                          00007540
878            INPUT @1 CLASS 7. @9 LABEL $40.;                                   00007550
879        *;                                                                     00007560
880                                                                               00007570

NOTE: INFILE SAROAD IS:
      DSNAME=xxxaaaa.FREDS85.SPM.AS.ALL.SAROAD.EBCDAT,
18      SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS   17:02 WEDNESDAY, JANUARY 4, 1989

        UNIT=DISK,VOL=SER=USR055,DISP=SHR,
        DCB=(BLKSIZE=4240,LRECL=80,RECFM=FB)
NOTE: 63 LINES WERE READ FROM INFILE SAROAD.
NOTE: DATA SET WORK.SAROAD HAS 63 OBSERVATIONS AND 2 VARIABLES. 902 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 164K.

880          PROC SORT DATA=SAROAD;                                                    00007570
881            BY CLASS;                                                               00007580
882                                                                                    00007590

NOTE: DATA SET WORK.SAROAD HAS 63 OBSERVATIONS AND 2 VARIABLES. 902 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.08 SECONDS AND 196K.

882          PROC SORT DATA=CLASSES;                                                   00007590
883            BY CLASS;                                                               00007600
884        *;                                                                          00007610
885                                                                                    00007620

NOTE: DATA SET WORK.CLASSES HAS 34 OBSERVATIONS AND 2 VARIABLES. 2346 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.09 SECONDS AND 196K.

885          DATA MATCH;                                                               00007620
886            MERGE SAROAD CLASSES(IN=IN2);                                           00007630
887            BY CLASS;                                                               00007640
888            IF IN2;                                                                 00007650
889        *;                                                                          00007660
890                                                                                    00007670

NOTE: DATA SET WORK.MATCH HAS 34 OBSERVATIONS AND 3 VARIABLES. 782 OBS/TRK.
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 192K.

890          PROC SORT DATA=MATCH;                                                     00007670
891            BY ORDER;                                                               00007680
892        *;                                                                          00007690
893                                                                                    00007700

NOTE: DATA SET WORK.MATCH HAS 34 OBSERVATIONS AND 3 VARIABLES. 782 OBS/TRK.
NOTE: THE PROCEDURE SORT USED 0.09 SECONDS AND 196K.

893          DATA _NULL_; SET MATCH;                                                   00007700
894            FILE PRINT HEADER=H NOTITLES;                                           00007710
895            PUT @40 ORDER 3. +4 CLASS 7. +4 LABEL $40.;                             00007720
896            RETURN;                                                                 00007730
897        *;                                                                          00007740
898        H:  PUT @37 '                  SPECIE DESCRIPTIONS'//                       00007750
899               @37 '   SF   POLLUTANT                    POLLUTANT'/                00007760
900               @37 ' NUMBER   SAROAD                   DESCRIPTION'/                00007770
901               @37 '---------------------------------------------------------'/;  00007780
902        *;                                                                          00007790
903        *---- PROCESS DETAILED REPORT (NOTE S, T, AND D REPRESENT                   00007800
904        *---- INCREMENTAL LEVELS OF DETAIL)                                         00007810
905        ;                                                                           00007820
906           %DETAIL                                                                  00007830
907       + PROC PRINT DATA                                                                     1-%detail

NOTE: 38 LINES WERE WRITTEN TO FILE PRINT.
NOTE: THE DATA STATEMENT USED 0.04 SECONDS AND 132K.
```

OUTPUT - THC/NO_x FILE Page 24 of 29

```
19   SAS(R) LOG   OS SAS 5.16          MVS/XA JOB xxxSPMA  STEP SM       PROC SAS     17:02 WEDNESDAY, JANUARY 4, 1989

909       +ORPHAN.NOTIME;                                                                  1-%detail
910       + VAR SCC STATE COUNTY;                                                          1-%detail
911       + TITLE 'EMISSION RECORDS WITH NO TIME ZONE DATA';                               1-%detail
912       + PROC PRINT DATA                                                                1-%detail
NOTE: NO OBSERVATIONS IN DATA SET ORPHAN.NOTIME .
NOTE: THE PROCEDURE PRINT USED 0.08 SECONDS AND 228K.

914       +ORPHAN.NOSPEC;                                                                  1-%detail
915       + VAR SCC STATE COUNTY;                                                          1-%detail
916       + TITLE 'EMISSION RECORDS WITH NO SPECIATION PROFILE';                           1-%detail
917       + FORMAT SCC Z8. STATE Z2. COUNTY Z4.;                                           1-%detail
918       + PROC MEANS MAXDEC                                                              1-%detail
NOTE: NO OBSERVATIONS IN DATA SET ORPHAN.NOSPEC .
NOTE: THE PROCEDURE PRINT USED 0.10 SECONDS AND 244K.

920       +0 SUM DATA=SMOUT.DATA ;                                                         1-%detail
921       + VAR SE1-SE34;                                                                  1-%detail
922       + TITLE 'ANNUAL TOTALS OF SPECIATED EMISSIONS';                                  1-%detail
923       + PROC PRINT DATA                                                                1-%detail
NOTE: THE PROCEDURE MEANS USED 22.60 SECONDS AND 284K AND PRINTED PAGE 1.

925       +SMOUT.DATA (OBS=200);                                                           1-%detail
926       + ID SCC STATE COUNTY;                                                           1-%detail
927       + VAR SE1-SE34;                                                                  1-%detail
928       + FORMAT SCC Z8. STATE Z2. COUNTY Z4.;                                           1-%detail
929       + TITLE 'APPLIED SPECIATION FACTORS';                                            1-%detail
930       + TITLE2 '(FIRST 200 OBSERVATIONS)';                                             1-%detail
932        *;                                                                      00007840
933        ********************                                                    00007850
934        * END MAIN PROGRAM *                                                    00007860
935        ********************                                                    00007870
936        ;                                                                       00007880
937        *;                                                                      00007890
NOTE: THE PROCEDURE PRINT USED 0.46 SECONDS AND 300K AND PRINTED PAGES 2 TO 9.
NOTE: SAS USED 644K MEMORY.
NOTE: SAS INSTITUTE INC.
      SAS CIRCLE
      PO BOX 8000
      CARY, N.C. 27511-8000
```

```
DATE: 04JAN89     TIME: 17:27:53
FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)                                              SPECIATION MODULE (SM)
DIAGNOSTIC REPORT                       1985 FREDS - AREA SOURCE SM, VERSION 2            000        DETAILED LISTING
------------------------------------------------------ CONTROL FILE LISTING ---------------------------------------------

RUN IDENTIFICATION RECORD:
    SOURCE: AS  DETAIL: D  SAS FILE: DATA  PSPLIT,SFF FLAGS: YN  RUN ID: 1985 FREDS - AREA SOURCE SM, V30

POLLUTANT SPECIES DEFINITION RECORDS:
                                                     MAJOR      # OF
                                          RECORD #  POLLUTANT  SPECIES
                                          ----------------------------
                                             1       ATHC        32
                                             2       ANOX         2
                                             3       ATSP        15
                                          ----------------------------
```

```
                    SPECIE DESCRIPTIONS
  SF    POLLUTANT                  POLLUTANT
NUMBER   SAROAD                   DESCRIPTION
-------------------------------------------------------
   1          1    METHANE
   2          2    ETHANE
   3          3    PROPANE
   4          4    ALKANES REACTIVITY1
   5          5    ALKANES REACTIVITY2
   6          6    ALKANES REACTIVITY3
   7          7    ALKANES REACTIVITY4
   8          8    ALKANE/AROMATIC MIX
   9          9    ETHENE
  10         10    PROPENE
  11         11    ALKENES PRIMARY
  12         12    ALKENES INTERNAL
  13         13    ALKENES PRIMARY/INTERNAL MIX
  14         14    BENZENE/HALOBENZENES
  15         15    AROMATICS REACTIVITY1
  16         16    AROMATICS REACTIVITY2
  17         17    PHENOLS/CRESOLS
  18         18    STYRENES
  19         19    FORMALDEHYDE
  20         20    HIGHER ALDEHYDES
  21         21    ACETONE
  22         22    HIGHER KETONES
  23         23    ORGANIC ACIDS
  24         24    ACETYLENE
  25         25    HALOALKENES
  26         26    UNREACTIVE HYDROCARBONS
  27         27    OTHER HYDROCARBONS REACTIVITY1
  28         28    OTHER HYDROCARBONS REACTIVITY2
  29         29    OTHER HYDROCARBONS REACTIVITY3
  30         30    OTHER HYDROCARBONS REACTIVITY4
  31         31    UNIDENTIFIED HYDROCARBONS
  32         32    UNASSIGNED HYDROCARBONS
  33      42601    NO
  34      42602    NO2

            ANNUAL TOTALS OF SPECIATED EMISSIONS     17:02 WEDNESDAY, JANUARY 4, 1989

                   VARIABLE          SUM

                   SE1       143118748981
                   SE2        12378352361
                   SE3         8113448626
                   SE4        23383275281
                   SE5        24194060045
                   SE6        19563070449
                   SE7         2661962159
                   SE8         1695457206
                   SE9        38558702442
                   SE10        4037126036
                   SE11        4226368401
                   SE12        9941741929
                   SE13        1703304338
                   SE14        9203309245
                   SE15       11778664762
                   SE16       15465400048
                   SE17         332719825
```

```
                                            SE18        1128926597
                                            SE19        8187498843
                                            SE20        2799560569
                                            SE21        1454419078
                                            SE22        1272635243
                                            SE23         773170982
                                            SE24        7537911634
                                            SE25        2204091070
                                            SE26        2501340315
                                            SE27        2319041668
                                            SE28       22648997664
                                            SE29       13341584063
                                            SE30        3509171840
                                            SE31       10661870914
                                            SE32        3962156400
                                            SE33          10500893
                                            SE34            573345

                                          APPLIED SPECIATION FACTORS              17:02 WEDNESDAY, JANUARY 4, 1989
                                           (FIRST 200 OBSERVATIONS)

 SCC    STATE COUNTY SE1    SE2       SE3      SE4      SE5     SE6   SE7 SE8 SE9    SE10     SE11 SE12 SE13   SE14      SE15    SE16

00000001 07   0265   0  18513.6  3692.1   5050.0  3882.9 1079.46  0   0   0  572.59  3398.0  0    0  1514.38  4521.2  4233.4
00000001 07   0425   0  41058.4  8188.1  11199.6  8611.4 2393.97  0   0   0 1269.85  7535.8  0    0  3358.50 10026.9  9388.5
00000001 07   0478   0  12609.0  2514.6   3439.4  2644.5  735.19  0   0   0  389.97  2314.2  0    0  1031.39  3079.3  2883.2
00000001 07   0565   0  21197.5  4227.3   5782.1  4445.8 1235.95  0   0   0  655.59  3890.6  0    0  1733.92  5176.7  4847.1
00000001 07   0705   0  23613.0  4709.0   6441.0  4952.5 1376.79  0   0   0  730.30  4333.9  0    0  1931.50  5766.6  5399.4
00000001 07   0725   0  19855.5  3959.7   5416.1  4164.4 1157.71  0   0   0  614.09  3644.3  0    0  1624.15  4849.0  4540.2
00000001 07   1155   0  11267.0  2246.9   3073.3  2363.1  656.94  0   0   0  348.47  2067.9  0    0   921.62  2751.5  2576.4
00000001 07   1505   0   9119.9  1818.7   2487.7  1912.8  531.75  0   0   0  282.06  1673.9  0    0   745.99  2227.2  2085.4
00000001 08   0060   0   2946.9   587.7    803.8   618.1  171.83  0   0   0   91.14   540.9  0    0   241.05   719.7   673.9
00000001 08   0180   0  10998.6  2193.4   3000.1  2306.8  641.29  0   0   0  340.16  2018.7  0    0   899.67  2686.0  2515.0
00000001 08   0240   0   2946.9   587.7    803.8   618.1  171.83  0   0   0   91.14   540.9  0    0   241.05   719.7   673.9
00000001 14   0040   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   0540   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   1320   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   1540   0  69239.4 13808.1  18886.7 14521.9 4037.11  0   0   0 2141.43 12708.1  0    0  5663.66 16909.1 15832.5
00000001 14   2600   0  14487.7  2889.2   3951.9  3038.6  844.73  0   0   0  448.07  2659.1  0    0  1185.07  3538.1  3312.8
00000001 14   2680   0   2141.8   427.1    584.2   449.2  124.88  0   0   0   66.24   393.1  0    0   175.19   523.0   489.7
00000001 14   2760   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   3060   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   3280   0   2141.8   427.1    584.2   449.2  124.88  0   0   0   66.24   393.1  0    0   175.19   523.0   489.7
00000001 14   3580   0   6167.6  1230.0   1682.4  1293.6  359.61  0   0   0  190.75  1132.0  0    0   504.50  1506.2  1410.3
00000001 14   3640   0   2141.8   427.1    584.2   449.2  124.88  0   0   0   66.24   393.1  0    0   175.19   523.0   489.7
00000001 14   3720   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9
00000001 14   3920   0   2141.8   427.1    584.2   449.2  124.88  0   0   0   66.24   393.1  0    0   175.19   523.0   489.7
00000001 14   4100   0    799.8   159.5    218.2   167.7   46.63  0   0   0   24.74   146.8  0    0    65.42   195.3   182.9

  SCC     STATE COUNTY SE17 SE18 SE19 SE20 SE21 SE22 SE23   SE24   SE25 SE26 SE27 SE28 SE29 SE30 SE31 SE32  SE33     SE34

00000001   07    0265   0    0    0    0    0    0    0   18544.9  0    0    0    0    0    0    0    0  0.98230 0.05170
00000001   07    0425   0    0    0    0    0    0    0   41127.8  0    0    0    0    0    0    0    0  2.17930 0.11470
00000001   07    0478   0    0    0    0    0    0    0   12630.3  0    0    0    0    0    0    0    0  0.66880 0.03520
00000001   07    0565   0    0    0    0    0    0    0   21233.3  0    0    0    0    0    0    0    0  1.12480 0.05920
00000001   07    0705   0    0    0    0    0    0    0   23652.9  0    0    0    0    0    0    0    0  1.25305 0.06595
00000001   07    0725   0    0    0    0    0    0    0   19889.1  0    0    0    0    0    0    0    0  1.05355 0.05545
00000001   07    1155   0    0    0    0    0    0    0   11286.1  0    0    0    0    0    0    0    0  0.59755 0.03145
00000001   07    1505   0    0    0    0    0    0    0    9135.3  0    0    0    0    0    0    0    0  0.48355 0.02545
00000001   08    0060   0    0    0    0    0    0    0    2951.9  0    0    0    0    0    0    0    0  0.15580 0.00820
00000001   08    0180   0    0    0    0    0    0    0   11017.2  0    0    0    0    0    0    0    0  0.58330 0.03070
00000001   08    0240   0    0    0    0    0    0    0    2951.9  0    0    0    0    0    0    0    0  0.15580 0.00820
```

OUTPUT - THC/NO_x FILE

```
  SYNCSORT    U.S. PATENT   4210961    COPYRIGHT SYNCSORT INC. 1987  REL 3.1BRI TPF3  DATE=89/004 TIME=17.04.58
                          SYNCSORT 3.1B        U. S.   E. P. A.      MVS/XA 3.8  CPU MODEL 3090
PARMEXIT : VSIO=REAL
SORTPARM : LIST,BMSG,MSG,MSGDD=SYSOUT
PARMLIST :
SORT FIELDS=(00573,008,FL,A,1,4,CH,A),FILSZ=00003472,DYNALLOC=(SYSDR,3)
RECORD LENGTH=00580,TYPE=F
WER131I  PARM FIELD ERROR - MSG,MSGD
WER161B  ALTERNATE PARM USED
WER164B  CORE AVAIL     6328320, REQUESTED MAX           ,
WER164B     RESERVE REQUESTED       12288, USED     6299648
WER146B  EMERGENCY SPACE ALLOCATED   8192
WER410B  CORE ABOVE 16 MEG AVAIL     5783552, RESERVE REQUESTED           0,
WER410B     USED     5783552
WER037B  G =     6944
WER177I  TURNAROUND SORT PERFORMED
WER045C  END SORT PH
WER055I  INSERT      3472, DELETE      3472
WER416B  EXCP COUNTS FOR SORTWORKS=           0,
WER416B     SORTIN=           0,  SORTOUT=           0
WER246I  FILESIZE 2,013,760 BYTES
WER054I  RCD IN         0, OUT         0
WER169I  TPF LEVEL     3
WER052I  END SYNCSORT;  xxxSPMA ,SM      ,SAS

  SYNCSORT    U.S. PATENT   4210961    COPYRIGHT SYNCSORT INC. 1987  REL 3.1BRI TPF3  DATE=89/004 TIME=17.05.53
                          SYNCSORT 3.1B        U. S.   E. P. A.      MVS/XA 3.8  CPU MODEL 3090
PARMEXIT : VSIO=REAL
SORTPARM : LIST,BMSG,MSG,MSGDD=SYSOUT
PARMLIST :
SORT FIELDS=(00005,008,FL,A,00013,008,FL,A,1,4,CH,A),FILSZ=00003088,DYNALLOC=(SY
SDR,3)
RECORD LENGTH=00036,TYPE=F
WER131I  PARM FIELD ERROR - MSG,MSGD
WER161B  ALTERNATE PARM USED
WER164B  CORE AVAIL     6328320, REQUESTED MAX           ,
WER164B     RESERVE REQUESTED       12288, USED     6299648
WER146B  EMERGENCY SPACE ALLOCATED   8192
WER410B  CORE ABOVE 16 MEG AVAIL     5783552, RESERVE REQUESTED           0,
WER410B     USED     5783552
WER037B  G =     6176
WER177I  TURNAROUND SORT PERFORMED
WER045C  END SORT PH
WER055I  INSERT      3088, DELETE      3088
WER416B  EXCP COUNTS FOR SORTWORKS=           0,
WER416B     SORTIN=           0,  SORTOUT=           0
WER246I  FILESIZE 111,168 BYTES
WER054I  RCD IN         0, OUT         0
WER169I  TPF LEVEL     3
WER052I  END SYNCSORT;  xxxSPMA ,SM      ,SAS
```

```
 SYNCSORT   U.S. PATENT   4210961    COPYRIGHT SYNCSORT INC. 1987  REL 3.1BRI TPF3  DATE=89/004 TIME=17.07.52
                        SYNCSORT 3.1B        U. S.   E. P. A.      MVS/XA 3.8  CPU MODEL 3090
PARMEXIT : VSIO=REAL
SORTPARM : LIST,BMSG,MSG,MSGDD=SYSOUT
PARMLIST :
SORT FIELDS=(00005,002,FL,A,00007,004,FL,A,1,4,CH,A),DYNALLOC=(SYSDR,3)
RECORD LENGTH=00038,TYPE=F
WER131I  PARM FIELD ERROR - MSG,MSGD
WER161B  ALTERNATE PARM USED
WER164B  CORE AVAIL      6328320, REQUESTED MAX           ,
WER164B     RESERVE REQUESTED        12288, USED     6299648
WER146B  EMERGENCY SPACE ALLOCATED   8192
WER410B  CORE ABOVE 16 MEG AVAIL     5783552, RESERVE REQUESTED           0,
WER410B     USED     5783552
WER037B  G =    96446
WER036B  B =      1185
WER162B  DISK SORTWORK (TRACKS) JCL PRIM=000000, JCL SEC=000000,
WER162B     TOTAL DYNALLOC=000480, TOTAL REL=000360, USED=000120
WER151B  SECONDARY EXTENTS OBTAINED 001
WER045C  END SORT PH
WER055I  INSERT    132884, DELETE    132884
WER416B  EXCP COUNTS FOR SORTWORKS=          17,
WER416B     SORTIN=            0,  SORTOUT=          0
WER246I  FILESIZE 5,049,592 BYTES
WER054I  RCD IN         0, OUT         0
WER169I  TPF LEVEL     3
WER052I  END SYNCSORT;  xxxSPMA ,SM      ,SAS

 SYNCSORT   U.S. PATENT   4210961    COPYRIGHT SYNCSORT INC. 1987  REL 3.1BRI TPF3  DATE=89/004 TIME=17.13.52
                        SYNCSORT 3.1B        U. S.   E. P. A.      MVS/XA 3.8  CPU MODEL 3090
PARMEXIT : VSIO=REAL
SORTPARM : LIST,BMSG,MSG,MSGDD=SYSOUT
PARMLIST :
SORT FIELDS=(00011,004,FL,A,00005,002,FL,A,00007,004,FL,A,1,4,CH,A),FILSZ=001328
84,DYNALLOC=(SYSDR,3)
RECORD LENGTH=00054,TYPE=F
WER131I  PARM FIELD ERROR - MSG,MSGD
WER161B  ALTERNATE PARM USED
WER164B  CORE AVAIL      6328320, REQUESTED MAX           ,
WER164B     RESERVE REQUESTED        12288, USED     6299648
WER146B  EMERGENCY SPACE ALLOCATED   8192
WER410B  CORE ABOVE 16 MEG AVAIL     5783552, RESERVE REQUESTED           0,
WER410B     USED     5783552
WER037B  G =    72322
WER036B  B =      846
WER162B  DISK SORTWORK (TRACKS) JCL PRIM=000000, JCL SEC=000000,
WER162B     TOTAL DYNALLOC=000465, TOTAL REL=000300, USED=000165
WER151B  SECONDARY EXTENTS OBTAINED 001
WER045C  END SORT PH
WER055I  INSERT    132884, DELETE    132884
WER416B  EXCP COUNTS FOR SORTWORKS=          23,
WER416B     SORTIN=            0,  SORTOUT=          0
WER246I  FILESIZE 7,175,736 BYTES
WER054I  RCD IN         0, OUT         0
WER169I  TPF LEVEL     3
WER052I  END SYNCSORT;  xxxSPMA ,SM      ,SAS
```

OUTPUT - THC/NO$_x$ FILE

```
  SYNCSORT    U.S. PATENT   4210961    COPYRIGHT SYNCSORT INC. 1987  REL 3.1BRI TPF3  DATE=89/004 TIME=17.27.55
                             SYNCSORT 3.1B        U. S.   E. P. A.      MVS/XA 3.8  CPU MODEL 3090
 PARMEXIT : VSIO=REAL
 SORTPARM : LIST,BMSG,MSG,MSGDD=SYSOUT
 PARMLIST :
 SORT FIELDS=(00005,008,FL,A,1,4,CH,A),FILSZ=00000063,DYNALLOC=(SYSDR,3)
 RECORD LENGTH=00052,TYPE=F
 WER131I  PARM FIELD ERROR - MSG,MSGD
 WER161B  ALTERNATE PARM USED
 WER164B  CORE AVAIL      6328320, REQUESTED MAX       ,
 WER164B     RESERVE REQUESTED       12288, USED     6299648
 WER146B  EMERGENCY SPACE ALLOCATED   8192
 WER410B  CORE ABOVE 16 MEG AVAIL     5783552, RESERVE REQUESTED           0,
 WER410B     USED     5783552
 WER037B  G =       126
 WER177I  TURNAROUND SORT PERFORMED
 WER045C  END SORT PH
 WER055I  INSERT          63, DELETE         63
 WER416B  EXCP COUNTS FOR SORTWORKS=          0,
 WER416B     SORTIN=           0,  SORTOUT=          0
 WER246I  FILESIZE 3,276 BYTES
 WER054I  RCD IN           0, OUT          0
 WER169I  TPF LEVEL     3
 WER052I  END SYNCSORT;  xxxSPMA ,SM       ,SAS

  SYNCSORT    U.S. PATENT   4210961    COPYRIGHT SYNCSORT INC. 1987  REL 3.1BRI TPF3  DATE=89/004 TIME=17.27.57
                             SYNCSORT 3.1B        U. S.   E. P. A.      MVS/XA 3.8  CPU MODEL 3090
 PARMEXIT : VSIO=REAL
 SORTPARM : LIST,BMSG,MSG,MSGDD=SYSOUT
 PARMLIST :
 SORT FIELDS=(00013,008,FL,A,1,4,CH,A),FILSZ=00000034,DYNALLOC=(SYSDR,3)
 RECORD LENGTH=00020,TYPE=F
 WER131I  PARM FIELD ERROR - MSG,MSGD
 WER161B  ALTERNATE PARM USED
 WER164B  CORE AVAIL      6328320, REQUESTED MAX       ,
 WER164B     RESERVE REQUESTED       12288, USED     6299648
 WER146B  EMERGENCY SPACE ALLOCATED   8192
 WER410B  CORE ABOVE 16 MEG AVAIL     5783552, RESERVE REQUESTED           0,
 WER410B     USED     5783552
 WER037B  G =       68
 WER177I  TURNAROUND SORT PERFORMED
 WER045C  END SORT PH
 WER055I  INSERT          34, DELETE         34
 WER416B  EXCP COUNTS FOR SORTWORKS=          0,
 WER416B     SORTIN=           0,  SORTOUT=          0
 WER246I  FILESIZE 680 BYTES
 WER054I  RCD IN           0, OUT          0
 WER169I  TPF LEVEL     3
 WER052I  END SYNCSORT;  xxxSPMA ,SM       ,SAS
```

SECTION 9

REFERENCES

1. Lebowitz, L.G., and A.S. Ackerman. Flexible Regional Emissions Data System (FREDS) Documentation for the 1980 NAPAP Emissions Inventory. EPA-600/7-87-025a (NTIS PB88-129499), U.S. Environmental Protection Agency, Research Triangle Park, NC. November 1987.

2. Sellars, F.M., T.E. Fitzgerald, Jr., J.M. Lennon, L.J. Maiocco, N.M. Monzione, and D.R. Neal, Jr. National Acid Precipitation Assessment Program Emission Inventory Allocation Factors, EPA-600/7-85-035 (NTIS PB86-104247), U.S. Environmental Protection Agency, Research Triangle Park, NC. September 1985.

3. Beaulieu, T.A. and L.G. Modica. Documentation of Spatial Allocation Factor Procedures for the 1980 NAPAP Emissions Inventory. EPA-600/7-88-024a (NTIS PB89-159479), U.S. Environmental Protection Agency, Research Triangle Park, NC. December 1988.

4. Wagner, J.K., R.A. Walters, L.J. Maiocco, and D.R. Neal. Development of the 1980 NAPAP Emissions Inventory. EPA-600/7-86-057a (NTIS PB88-132121), U.S. Environmental Protection Agency, Research Triangle Park, NC. December 1986.

5. Zimmerman, D., W. Tax, M. Smith, J. Demmy, and R. Battye. Anthropogenic Emissions Data for the 1985 NAPAP Inventory. EPA-600/7-88-022 (NTIS PB89-151419), U.S. Environmental Protection Agency, Air and Energy Engineering Research Laboratory, Research Triangle Park, NC. November 1988.

blank 412

APPENDIX A

HYDROCARBON PREPROCESSOR

```
OPTIONS MPRINT DQUOTE;
*----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM
               FOR THE 1985 NAPAP EMISSIONS INVENTORY (FREDS85)

  PROGRAM: HYDROCARBON PREPROCESSING MODULE (HCPREP)

  LANGUAGE: SAS (VERSION 5.16)

  PURPOSE: 1. TO INTERCONVERT NONMETHANE VOC AND TOTAL HYDROCARBON
              EMISSIONS
           2. TO ADJUST TOTAL EMISSIONS TO ACCOUNT FOR MISSING
              ALDEHYDE WEIGHT
           3. TO RETAIN REPORTED VOC OR THC FOR LATER REFERENCE

           NOTE: HCPREP IS RUN ON THE 1985 NAPAP ANNUAL EMISSIONS
                 FILES PRIOR TO FREDS PROCESSING TO ENSURE A
                 CONSISTENT BASIS FOR HYDROCARBON EMISSIONS.

 ----------------------------------------------------------------------

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME         ROUTINE                DESCRIPTION
=======================================================================
SCE            MAIN        SOURCE TYPE OF EMISSION FILE
HC_CODE        MAIN        SAROAD CODE OF INPUT HYDROCARBON
DETAIL         MAIN        LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
SASMEM         MAIN        SAS MEMBER NAME OF EMISSION FILE
RUN_ID         MAIN        RUN IDENTIFICATION HEADER

 ----------------------------------------------------------------------

  VARIABLE LIST: PROFILE/WEIGHT PERCENT FILE

NAME         ROUTINE                DESCRIPTION
=======================================================================
PROF_NO        MAIN        RADIAN SPECIATION PROFILE NUMBER
CH4PCT         MAIN        WEIGHT PERCENT METHANE IN PROFILE
HCHOPCT        MAIN        WEIGHT PERCENT ALDEHYDES IN PROFILE
CH4FLG         MAIN        METHANE AUGMENTATION FLAG (1=YES, 0=NO)
HCHOFLG        MAIN        ALDEHYDE AUGMENTATION FLAG

 ----------------------------------------------------------------------

  VARIABLE LIST: SCC/PROFILE FILE

NAME         ROUTINE                DESCRIPTION
=======================================================================
SCC            MAIN        SOURCE CLASSIFICATION CODE
PROF_NO        MAIN        RADIAN SPECIATION PROFILE NUMBER
ASSIGN         MAIN        ASSIGNMENT NUMBER (NOT USED)

 ----------------------------------------------------------------------

  VARIABLE LIST: GENERAL
```

```
NAME           ROUTINE                 DESCRIPTION
=========================================================================
TM              MAIN        SYSTEM TIME
DT              MAIN        SYSTEM DATE
_I_             MAIN        ARRAY INDEX
SOUR           DETAIL       EMISSION FILE SOURCE TYPE (AS OR PS)
IN1             MAIN        MERGE VARIABLE
IN2             MAIN        MERGE VARIABLE
REPO            MAIN        REPORT DETAIL LABEL
RUNCOL          MAIN        COLUMN REQUIRED TO CENTER RUN ID
LEVEL          DETAIL       LEVEL OF DETAIL FOR REPORT
NEW_VOC        ADJUST       UPDATED VOC VALUE
NEW_THC        ADJUST       UPDATED THC VALUE
ADJ_FAC         MAIN        ADJUSTMENT FACTOR, OLD VOC -> NEW THC
ORIG_HC         MAIN        INPUT HYDROCARBON VALUE TO ADJUST
SAROAD          MAIN        POLLUTANT SAROAD CODE
EMISS           MAIN        POLLUTANT EMISSIONS ESTIMATE, TONS/YR

-------------------------------------------------------------------------

  ERROR HANDLING:
     ERRORS IN THE CONTROL FILE WILL HALT PROGRAM EXECUTION.

  CALLED BY: xxxaaaa.FREDS85.HCPREP.JCL.CNTL

  METHOD: HCPREP INPUTS AND CHECKS THE CONTROL OPTIONS FILE.  THE
          PROFILE/WT PERCENT ADJUSTMENT FILE IS INPUT AND MERGED WITH
          THE APPROPRIATE SCC/PROFILE FILE TO YIELD A FILE WITH
          HYDROCARBON ADJUSTMENTS BY SCC.  THIS 'WTSCC' FILE IS
          MERGED WITH THE INPUT ANNUAL MASTERFILE, AND A REPORT
          IS PRINTED SUMMARIZING 'ORPHAN' EMISSIONS RECORDS.
          WEIGHT FRACTIONS FROM THE WTSCC FILE ARE USED TO
          DERIVE ANNUAL ADJUSTMENTS FOR ALDEHYDES AND 'NONREACTIVES'.
          THESE ADJUSTMENTS ARE APPLIED AS APPROPRIATE TO YIELD
          TRUE VOC AND THC.  REPORTED ANNUAL VOC OR THC IS
          RETAINED FOR FUTURE REFERENCE.

  PROGRAMMER: ROBERT WALTERS, ALLIANCE TECHNOLOGIES CORPORATION

  REVISIONS:
              VERSION 2 (9/87) - USE OF RADIAN PSPLIT INPUT FILES
                        TO AUGMENT BY WEIGHT, RATHER THAN PSPLIT
                        OUTPUT FILE (IN MOLES)
              VERSION 3 (11/87) - FIRST USE OF AUGMENT/NO AUGMENT
                          FLAGS FOR CH4/HCHO - ADDITION OF NEW
                          AUGMENTATION ALGORITHMS

*-----------------------------------------------------------------------*
;
************************************************************
***                   MACRO DEFINITIONS                  ***
************************************************************
;
*************** M A C R O   D E T A I L ***************

***** PRINT OUT DETAILED REPORT IF SO INSTRUCTED
;
%MACRO DETAIL;
%*;
```

```
%*---- PRINT NOSPEC (NO MATCH IN SPECIATION FILE)
;
%IF &LEVEL=D %THEN %DO;
   PROC PRINT DATA=ORPHAN.NOSPEC;
     VAR SCC STATE COUNTY
     %IF &SOUR=PS %THEN %DO;
       %LET ID=%STR(PLANT_ID POINT_ID;);
       PLANT_ID POINT_ID;
     %END;
     %ELSE %DO;
       %LET ID=%STR(;);
       ;
     %END;
     TITLE 'EMISSION RECORDS WITH NO SPECIATION PROFILE';
     FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
   PROC PRINT DATA=ORPHAN.NOPROF;
      VAR SCC PROF_NO;
      TITLE 'INVALID PROFILES IN SCC-PROFILE LISTING';
      FORMAT SCC Z8. PROF_NO Z4.;
   PROC PRINT DATA=SORT2;
      VAR PROF_NO CH4PCT HCHOPCT CH4FLG HCHOFLG ADJ_FAC;
      TITLE 'HYDROCARBON ADJUSTMENT DATA BY PROFILE';
%END;
%*;
%MEND DETAIL;
*;
*;
************************************************************
***                END OF MACRO DEFINITIONS              ***
************************************************************
;
************************************************************
***               MAIN PROGRAM:  H C P R E P             ***
************************************************************

***** THIS PROGRAM WILL:
                1. READ THE CONTROL OPTIONS FILE
                2. COMBINE THE SCC-PROFILE AND WT PERCENT-PROFILE
                   FILES INTO A WT PERCENT-SCC FILE (WTSCC)
                3. MERGE WTSCC WITH SUBSETTED EMISSION FILE
                4. PRODUCE A DIAGNOSTIC REPORT OF ALL SCC-LEVEL
                   RECORDS WITH NO MATCH IN WTSCC
                5. CREATE NEW DATA SET WITH ADJUSTED VOC/THC,
                   RETAINING ORIGINAL HYDROCARBON VALUE FOR
                   FUTURE REFERENCE.
;
************************************************************
***** 1. READ THE CONTROL OPTIONS FILE
************************************************************
;
DATA CTRL; INFILE COF;
*;
*     INPUT AND CHECK DATA
;
    INPUT @1 SCE $2. @4 HC_CODE 5. @10 DETAIL $1. @12 SASMEM $4.
    @17 RUN_ID $60.;
    IF SCE NE 'PS' AND SCE NE 'AS' THEN DO;
      PUT '*** FATAL: INVALID SOURCE TYPE ' SCE=;
      ABORT;
    END;
    IF HC_CODE NE 43101 AND HC_CODE NE 43104 THEN DO;
      PUT '*** FATAL: INVALID HYDROCARBON SAROAD  ' HC_CODE=;
      ABORT;
    END;
    IF DETAIL NE 'D' AND DETAIL NE 'S' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT ' DETAIL=;
      ABORT;
    END;
    RETURN;
*;
************************************************************
***** 2. CREATE SCC-WEIGHT PERCENT FILE
*****    CONTAINING HYDROCARBON ADJUSTMENT FACTORS
************************************************************
;
*---- SORT SCC-PROFILE FILE
;
PROC SORT DATA=SCCPROF.DATA OUT=SORT1;
   BY PROF_NO;
*---- CALCULATE ADJUSTMENT FACTORS BY PROFILE
;
DATA SORT2; SET WTPCT.DATA;
   ADJ_FAC=0;
   ADJ_FAC = ((HCHOPCT*HCHOFLG)+(CH4PCT*CH4FLG))/100;
*---- SORT WT PERCENT FILE
;
PROC SORT DATA=SORT2;
   BY PROF_NO;
*---- MERGE FILES TO FORM WTSCC
;
DATA WTSCC ORPHAN.NOPROF;
   MERGE SORT1 (IN=IN1) SORT2 (IN=IN2);
   BY PROF_NO;
   DROP ASSIGN HCHOPCT HCHOFLG CH4FLG;
   IF IN1 AND IN2 THEN OUTPUT WTSCC;
   ELSE IF IN1 THEN OUTPUT ORPHAN.NOPROF;
*---- SORT WTSCC TO PREPARE FOR MERGE
;
PROC SORT DATA=WTSCC; BY SCC;
*;
************************************************************
***** 3. MERGE WT PERCENT DATA WITH EMISSIONS MASTER FILE
************************************************************
;
PROC SORT DATA=MASTER.DATA OUT=SORTED.MASTER;
   BY SCC;
*;
DATA OUTTEMP.TEMP ORPHAN.NOSPEC;
   MERGE SORTED.MASTER (IN=IN1) WTSCC(IN=IN2);
   BY SCC;
   IF IN1 AND IN2 THEN OUTPUT OUTTEMP.TEMP;
   ELSE IF IN1 THEN OUTPUT ORPHAN.NOSPEC;
*;
************************************************************
***** 4. WRITE DIAGNOSTIC REPORT FOR SPECIATION
************************************************************
;
*---- DEFINE FILES AND INITIALIZE VARIABLES
```

```
;
DATA _NULL_; SET CTRL;
  FILE PRINT NOTITLES;
  IF DETAIL='S' THEN REPO=' SUMMARY'; ELSE REPO='DETAILED';
  DT=DATE();TM=TIME();
  RUNCOL=66-LENGTH(RUN_ID)/2;
*;
*---- PRINT HEADER
;
  PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
      @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
      @99 'HYDROCARBON PREPROCESSOR (HCPREP)'//@2 'DIAGNOSTIC REPORT'
      @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
      'CONTROL FILE LISTING' @77 55*'-'//;
*;
*---- PRINT COF RECORD
;
  PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SOURCE: ' SCE ' HC CODE: '
      HC_CODE ' DETAIL: ' DETAIL ' SAS FILE: ' SASMEM 'RUN ID: '
      RUN_ID///;
*;
*;
*---- PRINT DETAILED REPORT IF SO INSTRUCTED
;
CALL SYMPUT('LEVEL',DETAIL);
CALL SYMPUT('SOUR',SCE);
CALL SYMPUT('CODE',HC_CODE);
RUN;
%DETAIL
*;
;
************************************************************
***** 5. ADJUST HYDROCARBON VALUES BASED ON SOURCE FILE
*****    AND OUTPUT NEW DATA SET
************************************************************
;
DATA OUTFILE.DATA; SET OUTTEMP.TEMP;
   DROP PROF_NO CH4PCT NEW_VOC NEW_THC ADJ_FAC NEWCODE;
   LENGTH NEWCODE 8;
   NEWCODE=&CODE;
   IF _N_=1 THEN PUT NEWCODE=;
   NEW_VOC=0;
   NEW_THC=0;
   ORIG_HC=0;
   ARRAY SAROAD SAROAD1-SAROAD15;
   ARRAY EMISS EMISS1-EMISS15;
;
*---- EXTRACT INPUT HYDROCARBON EMISSION VALUE
;
   DO _I_=1 TO NUMPOLL;
      IF SAROAD=NEWCODE THEN ORIG_HC=EMISS;
   END;
;
*---- CALCULATE UPDATED TOTAL HYDROCARBONS.  NOTE IF ADJ_FAC=0,
*--- NO AUGMENTATION NEEDED, OTHERWISE ADJUST
;
   IF ADJ_FAC = 0 THEN NEW_THC = ORIG_HC;
   ELSE NEW_THC = ORIG_HC/(1-ADJ_FAC);
;
```

```
*--- CALCULATE VOC BY REMOVING METHANE FROM THC
;
   NEW_VOC - NEW_THC * ((100.00-CH4PCT)/100.00);
;
*---- PLACE NEW HYDROCARBON VALUES IN EMISSION ARRAY.  ONE
*---- VALUE REPLACES OLD DATA, THE OTHER REQUIRES NEW ARRAY
*---- ELEMENT
;
   IF NEWCODE-43104 THEN DO;
      DO _I_-1 TO NUMPOLL;
         IF SAROAD-43104 THEN EMISS-NEW_VOC;
      END;
      NUMPOLL - NUMPOLL + 1;
      _I_-NUMPOLL;
      SAROAD-43101;
      EMISS-NEW_THC;
   END;
   ELSE DO;
      DO _I_-1 TO NUMPOLL;
         IF SAROAD-43101 THEN EMISS-NEW_THC;
      END;
      NUMPOLL - NUMPOLL + 1;
      _I_-NUMPOLL;
      SAROAD-43104;
      EMISS-NEW_VOC;
   END;
*;
*;
********************
* END MAIN PROGRAM *
********************
*;
/*
```

APPENDIX B

QUALITY CONTROL MODULE

```
*----------------------------------------------------------------*
*                        FREDS.QASUMS.SAS                        *
*----------------------------------------------------------------*
* APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)   *
*                                                                *
* PROGRAM    : QUALITY CONTROL MODULE (QCM)                      *
*                                                                *
* LANGUAGE   : SAS (VERSION 5.16)                                *
*                                                                *
* PURPOSE    : TO PERFORM QUALITY CONTROL MEASURES ON EMISSIONS  *
*              AND ALLOCATION FACTORS                            *
*----------------------------------------------------------------*
*                                                                *
* VARIABLE LIST: CONTROL OPTIONS FILE                            *
*                                                                *
* NAME         DESCRIPTION                                       *
* ______________________________________________________________ *
* STEP         FREDS PROCESSING STEP                             *
* COUNTRY      EMISSIONS' COUNTRY OF ORIGIN                      *
* SOURCE       TYPE OF EMISSIONS SOURCE                          *
* MAXPRINT     MAXIMUM NUMBER OF DIAGNOSTIC ERRORS TO PRINT      *
* COMPARE      INDICATES OLD OR NEW COMPARISON FILE              *
* TOL1         TOLERANCE FOR POLLUTANT SO2                       *
* TOL2         TOLERANCE FOR POLLUTANT SO4                       *
* TOL3         TOLERANCE FOR POLLUTANT NOX                       *
* TOL4         TOLERANCE FOR POLLUTANT CO                        *
* TOL5         TOLERANCE FOR POLLUTANT HCL                       *
* TOL6         TOLERANCE FOR POLLUTANT HF                        *
* TOL7         TOLERANCE FOR POLLUTANT NH3                       *
* TOL8         TOLERANCE FOR POLLUTANT TSP                       *
* TOL9         TOLERANCE FOR POLLUTANT VOC                       *
* TOL10        TOLERANCE FOR POLLUTANT THC                       *
* SEATOL       TOLERANCE FOR SEASONAL TEMPORAL ALLOCATION FACTOR *
* DAYTOL       TOLERANCE FOR DAILY TEMPORAL ALLOCATION FACTOR    *
* HOURTOL      TOLERANCE FOR HOURLY TEMPORAL ALLOCATION FACTOR   *
* SCC1-SCC20   USER SPECIFIES SCC'S                              *
* ______________________________________________________________ *
*                                                                *
* PROGRAMMERS  : DANIEL DULLEBA, DANIEL MUDGETT, & ROB WALTERS   *
*                ALLIANCE TECHNOLOGIES CORPORATION, 1987         *
*                                                                *
* ______________________________________________________________ *
*;
OPTIONS SOURCE NOTEXT82 MPRINT MACROGEN ;
******************************************************************
****                    MACRO DEFINITIONS                     ****
******************************************************************
*---- MACRO READCOF
*     MACRO TO READ DATA FROM COF, ASSIGN GLOBAL VARIABLES,
*     AND CALL APPROPRIATE MACRO SUBROUTINE
*;
%MACRO READCOF;
  DATA TEMP1; INFILE COF;
    ARRAY TOL TOL1-TOL10;
    INPUT @1 STEP $3. @5 COUNTRY $3. @9 SOURCE $1. @11 MAXPRINT 5.
          @17 COMPARE $3.
       #2 @1  TOL1  8.6 @10 TOL2  8.6 @19 TOL3 8.6
       #3 @1  TOL4  8.6 @10 TOL5  8.6 @19 TOL6 8.6
       #4 @1  TOL7  8.6 @10 TOL8  8.6 @19 TOL9 8.6
       #5 @1  TOL10 8.6
       #6 @1 SEATOL 8.6 @10 DAYTOL 8.6 @19 HOURTOL 8.6
       #7 @1  SCC1  8. @10 SCC2  8. @19 SCC3 8. @28 SCC4 8.
          @37 SCC5  8.
       #8 @1  SCC6  8. @10 SCC7  8. @19 SCC8 8. @28 SCC9 8.
          @37 SCC10 8.
       #9 @1  SCC11 8. @10 SCC12 8. @19 SCC13 8.
          @28 SCC14 8. @37 SCC15 8.
      #10 @1  SCC16 8. @10 SCC17 8. @19 SCC18 8.
          @28 SCC19 8. @37 SCC20 8.;
  %GLOBAL SCC1  SCC2  SCC3  SCC4  SCC5
          SCC6  SCC7  SCC8  SCC9  SCC10
          SCC11 SCC12 SCC13 SCC14 SCC15
          SCC16 SCC17 SCC18 SCC19 SCC20
          SOURCE STEP COUNTRY CHOICE
          TOL1 TOL2 TOL3 TOL4 TOL5
          TOL6 TOL7 TOL8 TOL9 TOL10
          SEATOL DAYTOL HOURTOL MAXPRINT COMPARE;
  %DO XX-1 %TO 20;
     CALL SYMPUT("SCC&XX",SCC&XX);
  %END;
  %DO XX-1 %TO 10;
     CALL SYMPUT("TOL&XX",TOL&XX);
  %END;
  CALL SYMPUT("STEP",STEP);
  CALL SYMPUT("COUNTRY",COUNTRY);
  CALL SYMPUT("SOURCE",SOURCE);
  CALL SYMPUT("SEATOL",SEATOL);
  CALL SYMPUT("DAYTOL",DAYTOL);
  CALL SYMPUT("HOURTOL",HOURTOL);
  CALL SYMPUT("MAXPRINT",MAXPRINT);
  CALL SYMPUT("COMPARE",COMPARE);
  RUN;
  DATA TEMP1; SET TEMP1;
    CHOICE-"ALL&STEP&SOURCE";
    IF (STEP-"SAM" OR STEP-"TAM") AND SOURCE="A"
    THEN CHOICE-"&COUNTRY&STEP&SOURCE";
    CALL SYMPUT("CHOICE",CHOICE);
  DATA _NULL_; SET TEMP1;
    TDAY-DATE();
    PUT _PAGE_;
    PUT @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM' @70 TDAY MMDDYY8.
    / @2 'QUALITY CONTROL MODULE CONTROL OPTIONS FILE LISTING'/
    @2 80*'-'
    // @2 'STEP:' @8 STEP @17 'COUNTRY:' @26 COUNTRY @35 'SOURCE:'
    @43 SOURCE / @2 'MAXPRINT:' @17 MAXPRINT
    @25 'NEW OR OLD COMP. FILE:' @48 COMPARE //
    @2 'POLLUTANT TOLERANCES:' @24 'SO2:' @29 TOL1 /
                               @24 'SO4:' @29 TOL2 /
                               @24 'NOX:' @29 TOL3 /
                               @24 'CO :' @29 TOL4 /
                               @24 'HCL:' @29 TOL5 /
                               @24 'HF :' @29 TOL6 /
                               @24 'NH3:' @29 TOL7 /
                               @24 'TSP:' @29 TOL8 /
                               @24 'VOC:' @29 TOL9 /
                               @24 'THC:' @29 TOL10 //;
PUT @2 'TEMPORAL FACTOR TOLERANCES:' @30 'SEASONAL:' @40 SEATOL /
                                     @30 'DAILY   :' @40 DAYTOL /
```

```
                                       @30 'HOURLY  :' @40 HOURTOL //;
PUT @2 'USER SPECIFIED SCC'S:' @24 SCC1  SCC2  SCC3  SCC4  /
                               @24 SCC5  SCC6  SCC7  SCC8  /
                               @24 SCC9  SCC10 SCC11 SCC12 /
                               @24 SCC13 SCC14 SCC15 SCC16 /
                               @24 SCC17 SCC18 SCC19 SCC20;
  PUT _PAGE_;
  RUN;
  %&CHOICE
%MEND READCOF;
******************************************************************
*---- MACRO SUBSETP1
*     MACRO TO ELIMINATE UNECESSARY POINT SOURCE VARIABLES
*;
%MACRO SUBSETP1(IFILE,OFILE);
  DATA &OFILE; SET &IFILE;
     ARRAY POLL SO2POL SO4POL NOXPOL COPOL HCLPOL
                HFPOL NH3POL TSPPOL VOCPOL THCPOL;
     KEEP STATE COUNTY PLANT_ID POINT_ID SCC SO2POL--THCPOL;
%MEND SUBSETP1;
******************************************************************
*     MACRO TO ELIMINATE UNECESSARY POINT SOURCE VARIABLES
*     FOR SPECIATED FILES
*;
%MACRO SUBSETP2(IFILE,OFILE);
  DATA &OFILE; SET &IFILE;
     ARRAY POLL    SO2POL SO4POL NOXPOL COPOL HCLPOL
                   HFPOL NH3POL TSPPOL VOCPOL THCPOL;
     ARRAY QASPEC  QHC1 QHC2 QHC3 QHC4 QHC5 QHC6 QHC7 QHC8 QHC9 QHC10
                    QHC11 QHC12 QHC13 QHC14 QHC15 QHC16 QHC17 QHC18 QHC19
                    QHC20 QHC21 QHC22 QHC23 QHC24 QHC25 QHC26 QHC27 QHC28
                    QHC29 QHC30 QHC31 QHC32 QNO QNO2 QCA1 QCA2 QCA3 QMG1
                    QMG2 QMG3 QK1 QK2 QK3 QNA1 QNA2 QNA3 QPM1 QPM2 QPM3;
     KEEP STATE COUNTY PLANT_ID POINT_ID SCC
          SO2POL--THCPOL QHC1--QPM3;
     SCC = FLOOR(SCC/100);
%MEND SUBSETP2;
******************************************************************
*---- MACRO SUBSETA1
*     MACRO TO ELIMINATE UNECESSARY AREA SOURCE VARIABLES
*     FOR STEPS ONE AND HCP
*;
%MACRO SUBSETA1(IFILE,OFILE);
  DATA &OFILE; SET &IFILE;
    ARRAY POLL SO2POL SO4POL NOXPOL COPOL  HCLPOL
               HFPOL  NH3POL TSPPOL VOCPOL THCPOL;
    KEEP STATE COUNTY SCC SO2POL--THCPOL;
%MEND SUBSETA1;
******************************************************************
*---- MACRO SUBSETA2
*     MACRO TO ELIMINATE UNECESSARY AREA SOURCE VARIABLES
*     FOR STEPS MDM AND SPM
*;
%MACRO SUBSETA2(OFILE);
  PROC SORT DATA=ALL&STEP.A1.DATA OUT=TEMP5.DATA; BY STATE COUNTY SCC;
  PROC SORT DATA=ALL&STEP.A2.DATA OUT=TEMP6.DATA; BY STATE COUNTY SCC;
  DATA &OFILE; MERGE TEMP5.DATA TEMP6.DATA;
    BY STATE COUNTY SCC;
    RENAME ASO2=SO2POL ASO4=SO4POL ANOX=NOXPOL ACO=COPOL   AHCL=HCLPOL
```

```
          AHF =HFPOL  ANH3=NH3POL ATSP=TSPPOL AVOC=VOCPOL ATHC=THCPOL;
%MEND SUBSETA2;
*******************************************************************
*---- MACRO SUBSETA3
*     MACRO TO ELIMINATE UNECESSARY AREA SOURCE VARIABLES
*     FOR SPECIATED FILES
*;
%MACRO SUBSETA3(IFILE1,IFILE2,OFILE);
  PROC SORT DATA=&IFILE1 OUT=TEMP5.DATA; BY STATE COUNTY SCC;
  PROC SORT DATA=&IFILE2 OUT=TEMP6.DATA; BY STATE COUNTY SCC;
  DATA &OFILE; MERGE TEMP5.DATA TEMP6.DATA;
    BY STATE COUNTY SCC;
     ARRAY POLL   SO2POL SO4POL NOXPOL COPOL  HCLPOL
                  HFPOL  NH3POL TSPPOL VOCPOL THCPOL;
     ARRAY QASPEC  QHC1 QHC2 QHC3 QHC4 QHC5 QHC6 QHC7 QHC8 QHC9 QHC10
                   QHC11 QHC12 QHC13 QHC14 QHC15 QHC16 QHC17 QHC18 QHC19
                   QHC20 QHC21 QHC22 QHC23 QHC24 QHC25 QHC26 QHC27 QHC28
                   QHC29 QHC30 QHC31 QHC32 QNO QNO2 QCA1 QCA2 QCA3 QMG1
                   QMG2 QMG3 QK1 QK2 QK3 QNA1 QNA2 QNA3 QPM1 QPM2 QPM3;
     KEEP STATE COUNTY SCC ASO2 ASO4 ANOX ACO AHCL AHF ANH3 ATSP
         AVOC ATHC SE1--SE34 SE35--SE49;
     RENAME ASO2=SO2POL ASO4=SO4POL ANOX=NOXPOL ACO=COPOL   AHCL=HCLPOL
            AHF =HFPOL  ANH3=NH3POL ATSP=TSPPOL AVOC=VOCPOL ATHC=THCPOL
            SE1 =QHC1  SE2 =QHC2  SE3 =QHC3  SE4 =QHC4  SE5 =QHC5
            SE6 =QHC6  SE7 =QHC7  SE8 =QHC8  SE9 =QHC9  SE10=QHC10
            SE11=QHC11 SE12=QHC12 SE13=QHC13 SE14=QHC14 SE15=QHC15
            SE16=QHC16 SE17=QHC17 SE18=QHC18 SE19=QHC19 SE20=QHC20
            SE21=QHC21 SE22=QHC22 SE23=QHC23 SE24=QHC24 SE25=QHC25
            SE26=QHC26 SE27=QHC27 SE28=QHC28 SE29=QHC29 SE30=QHC30
            SE31=QHC31 SE32=QHC32 SE33=QNO   SE34=QNO2  SE35=QCA1
            SE36=QCA2  SE37=QCA3  SE38=QMG1  SE39=QMG2  SE40=QMG3
            SE41=QK1   SE42=QK2   SE43=QK3   SE44=QNA1  SE45=QNA2
            SE46=QNA3  SE47=QPM1  SE48=QPM2  SE49=QPM3;
%MEND SUBSETA3;
*******************************************************************
*---- MACRO SUBSETA4
*     MACRO TO SUBSET AREA SOURCE FILE FOR STEP SAM
*;
%MACRO SUBSETA4(IFILE1,IFILE2,OFILE);
  PROC SORT DATA=&IFILE1 OUT=TEMP5.DATA;
    BY STATE COUNTY SCC COL ROW;
  PROC SORT DATA=&IFILE2 OUT=TEMP6.DATA;
    BY STATE COUNTY SCC COL ROW;
  DATA &OFILE; MERGE TEMP5.DATA TEMP6.DATA;
    BY STATE COUNTY SCC COL ROW;
    ARRAY POLL   SO2POL SO4POL NOXPOL COPOL  HCLPOL
                 HFPOL  NH3POL TSPPOL VOCPOL THCPOL;
    KEEP STATE COUNTY SCC SO2 SO4 NOX CO HCL HF NH3 TSP VOC THC;
    HF=0; HCL=0;
    RENAME SO2=SO2POL SO4=SO4POL NOX=NOXPOL CO=COPOL   HCL=HCLPOL
           HF=HFPOL   NH3=NH3POL TSP=TSPPOL VOC=VOCPOL THC=THCPOL;
%MEND SUBSETA4;
*******************************************************************
*---- MACRO SUBSETA5
*     MACRO TO SUBSET AREA SOURCE FILE FOR STEPS TAM AND MIP
*;
%MACRO SUBSETA5(IFILE1,IFILE2,OFILE);
  PROC SORT DATA=&IFILE1 OUT=TEMP5.DATA;
    BY COL ROW GMT;
  PROC SORT DATA=&IFILE2 OUT=TEMP6.DATA;
    BY COL ROW GMT;
  DATA TEMP7.DATA; SET TEMP5.DATA;
    BY COL ROW GMT;
    KEEP COL ROW GMT TOT1 TOT2 TOT3;
    RENAME TOT1=NOXPOL TOT2=VOCPOL TOT3=THCPOL;
  DATA TEMP8.DATA; SET TEMP6.DATA;
    BY COL ROW GMT;
    KEEP COL ROW GMT TOT1 TOT2 TOT3 TOT4 TOT5 HCLPOL HFPOL;
    HCLPOL=0; HFPOL=0;
    RENAME TOT1=SO2POL TOT2=SO4POL TOT3=TSPPOL TOT4=COPOL TOT5=NH3POL;
  DATA &OFILE; MERGE TEMP7.DATA TEMP8.DATA;
    BY COL ROW GMT;
    KEEP SO2POL SO4POL NOXPOL COPOL  HCLPOL
         HFPOL  NH3POL TSPPOL VOCPOL THCPOL;
    ARRAY POLL   SO2POL SO4POL NOXPOL COPOL  HCLPOL
                HFPOL  NH3POL TSPPOL VOCPOL THCPOL;
%MEND SUBSETA5;
*******************************************************************
*---- MACRO SUBSCC
*     MACRO TO SUBSET DATA FOR SPECIFIED SCC'S IN COF
*;
%MACRO SUBSCC(IFILE,OFILE);
       DATA &OFILE; SET &IFILE;
         IF SCC=%EVAL(&SCC1)  OR SCC=%EVAL(&SCC2)  OR
            SCC=%EVAL(&SCC3)  OR SCC=%EVAL(&SCC4)  OR
            SCC=%EVAL(&SCC5)  OR SCC=%EVAL(&SCC6)  OR
            SCC=%EVAL(&SCC7)  OR SCC=%EVAL(&SCC8)  OR
            SCC=%EVAL(&SCC9)  OR SCC=%EVAL(&SCC10) OR
            SCC=%EVAL(&SCC11) OR SCC=%EVAL(&SCC12) OR
            SCC=%EVAL(&SCC13) OR SCC=%EVAL(&SCC14) OR
            SCC=%EVAL(&SCC15) OR SCC=%EVAL(&SCC16) OR
            SCC=%EVAL(&SCC17) OR SCC=%EVAL(&SCC18) OR
            SCC=%EVAL(&SCC19) OR SCC=%EVAL(&SCC20)
            THEN OUTPUT;
%MEND SUBSCC;
*******************************************************************
*
*---- MACRO POLLNAME
*     MACRO TO ASSIGN MEANINGFUL VARIABLE NAMES TO POLLUTANTS
*;
%MACRO POLLNAME;
       ARRAY SAROAD SAROAD1-SAROAD15;
       ARRAY EMISS EMISS1-EMISS15;
       *
       *---- INITIALIZE POLL ARRAY AT 0
       *;
       DO OVER POLL;
          POLL=0;
       END;
       DO _I_ = 1 TO NUMPOLL;
          IF SAROAD=42401 THEN SO2POL=EMISS;
          ELSE IF SAROAD=12403 THEN SO4POL=EMISS;
          ELSE IF SAROAD=42603 THEN NOXPOL=EMISS;
          ELSE IF SAROAD=42101 THEN COPOL=EMISS;
          ELSE IF SAROAD=42302 THEN HCLPOL=EMISS;
          ELSE IF SAROAD=42303 THEN HFPOL=EMISS;
          ELSE IF SAROAD=42604 THEN NH3POL=EMISS;
          ELSE IF SAROAD=11101 THEN TSPPOL=EMISS;
          ELSE IF SAROAD=43104 THEN VOCPOL=EMISS;
          ELSE IF SAROAD=43101 THEN THCPOL=EMISS;
       END;
%MEND POLLNAME;
******************************************************************
*
*---- MACRO SPECNAME
*     MACRO TO ASSIGN MEANINGFUL VARIABLE NAMES TO SPECIES
*;
%MACRO SPECNAME;
       ARRAY SF SF1-SF49;
       ARRAY CLASS CLASS1-CLASS49;
       *
       *---- INITIALIZE SPECIES ARRAY AND SPECIES TOTALS TO 0
       *;
       DO OVER QASPEC;
          QASPEC=0;
       END;
       DO _I_ = 1 TO NUMSP;
         *
         *---- RENAME THC SPECIES
         *;
         IF CLASS= 1 THEN QHC1 = SF*907.18474*THCPOL;
         IF CLASS= 2 THEN QHC2 = SF*907.18474*THCPOL;
         IF CLASS= 3 THEN QHC3 = SF*907.18474*THCPOL;
         IF CLASS= 4 THEN QHC4 = SF*907.18474*THCPOL;
         IF CLASS= 5 THEN QHC5 = SF*907.18474*THCPOL;
         IF CLASS= 6 THEN QHC6 = SF*907.18474*THCPOL;
         IF CLASS= 7 THEN QHC7 = SF*907.18474*THCPOL;
         IF CLASS= 8 THEN QHC8 = SF*907.18474*THCPOL;
         IF CLASS= 9 THEN QHC9 = SF*907.18474*THCPOL;
         IF CLASS=10 THEN QHC10 = SF*907.18474*THCPOL;
         IF CLASS=11 THEN QHC11 = SF*907.18474*THCPOL;
         IF CLASS=12 THEN QHC12 = SF*907.18474*THCPOL;
         IF CLASS=13 THEN QHC13 = SF*907.18474*THCPOL;
         IF CLASS=14 THEN QHC14 = SF*907.18474*THCPOL;
         IF CLASS=15 THEN QHC15 = SF*907.18474*THCPOL;
         IF CLASS=16 THEN QHC16 = SF*907.18474*THCPOL;
         IF CLASS=17 THEN QHC17 = SF*907.18474*THCPOL;
         IF CLASS=18 THEN QHC18 = SF*907.18474*THCPOL;
         IF CLASS=19 THEN QHC19 = SF*907.18474*THCPOL;
         IF CLASS=20 THEN QHC20 = SF*907.18474*THCPOL;
         IF CLASS=21 THEN QHC21 = SF*907.18474*THCPOL;
         IF CLASS=22 THEN QHC22 = SF*907.18474*THCPOL;
         IF CLASS=23 THEN QHC23 = SF*907.18474*THCPOL;
         IF CLASS=24 THEN QHC24 = SF*907.18474*THCPOL;
         IF CLASS=25 THEN QHC25 = SF*907.18474*THCPOL;
         IF CLASS=26 THEN QHC26 = SF*907.18474*THCPOL;
         IF CLASS=27 THEN QHC27 = SF*907.18474*THCPOL;
         IF CLASS=28 THEN QHC28 = SF*907.18474*THCPOL;
         IF CLASS=29 THEN QHC29 = SF*907.18474*THCPOL;
         IF CLASS=30 THEN QHC30 = SF*907.18474*THCPOL;
         IF CLASS=31 THEN QHC31 = SF*907.18474*THCPOL;
         IF CLASS=32 THEN QHC32 = SF*907.18474*THCPOL;
         *
         *---- RENAME NOX SPECIES
         *;
         IF CLASS=42601 THEN QNO      = SF*NOXPOL;
         IF CLASS=42602 THEN QNO2     = SF*NOXPOL;
         *
         *---- RENAME TSP SPECIES
         *;
         IF CLASS=1012111 THEN QCA1 = SF*TSPPOL;
         IF CLASS=3012111 THEN QCA2 = SF*TSPPOL;
         IF CLASS=5012111 THEN QCA3 = SF*TSPPOL;
         IF CLASS=1012140 THEN QMG1 = SF*TSPPOL;
         IF CLASS=3012140 THEN QMG2 = SF*TSPPOL;
         IF CLASS=5012140 THEN QMG3 = SF*TSPPOL;
         IF CLASS=1012180 THEN QK1 = SF*TSPPOL;
         IF CLASS=3012180 THEN QK2 = SF*TSPPOL;
         IF CLASS=5012180 THEN QK3 = SF*TSPPOL;
         IF CLASS=1012184 THEN QNA1 = SF*TSPPOL;
         IF CLASS=3012184 THEN QNA2 = SF*TSPPOL;
         IF CLASS=5012184 THEN QNA3 = SF*TSPPOL;
         IF CLASS=1011101 THEN QPM1 = SF*TSPPOL;
         IF CLASS=2011101 THEN QPM2 = SF*TSPPOL;
         IF CLASS=4011101 THEN QPM3 = SF*TSPPOL;
       END;
%MEND SPECNAME;
*******************************************************************
*---- MACRO TOTAL1
*     MACRO TO CALCULATE BASELINE NATIONAL POLLUTANT TOTALS
*;
%MACRO TOTAL1(IFILE,OFILE);
       DATA &OFILE;
         SET &IFILE END=EOF;
         ARRAY POLL SO2POL SO4POL NOXPOL COPOL HCLPOL
                    HFPOL NH3POL TSPPOL VOCPOL THCPOL;
         ARRAY SPOLL SO2 SO4 NOX CO HCL HF NH3 TSP VOC THC;
         RETAIN SO2--THC;
         KEEP SO2--THC;
         *
         *---- ZERO SUMS
         *;
         IF _N_=1 THEN DO OVER SPOLL;
            SPOLL=0;
         END;
         *
         *---- ACCUMULATE SUMS
         *;
         DO OVER SPOLL;
            SPOLL=SUM(SPOLL,POLL);
         END;
         *
         *---- OUTPUT
         *;
         IF EOF THEN OUTPUT;
%MEND TOTAL1;
*******************************************************************
*---- MACRO TOTAL2
*     MACRO TO SUM AND STORE NATIONAL POLLUTANT TOTALS
*;
%MACRO TOTAL2(IFILE,OFILE);
       DATA &OFILE;
         SET &IFILE END=EOF;
         ARRAY POLL SO2POL SO4POL NOXPOL COPOL HCLPOL
                    HFPOL NH3POL TSPPOL VOCPOL THCPOL;
         ARRAY QAPOLL QASO2 QASO4 QANOX QACO QAHCL
```

```
                      QAHF QANH3 QATSP QAVOC QATHC;
         RETAIN QASO2--QATHC;
         KEEP QASO2--QATHC;
         *
         *---- ZERO SUMS
         *;
         IF _N_-1 THEN DO OVER QAPOLL;
            QAPOLL-0;
         END;
         *
         *---- ACCUMULATE SUMS
         *;
         DO OVER QAPOLL;
            QAPOLL-SUM(QAPOLL,POLL);
         END;
         *
         *---- OUTPUT
         *;
         IF EOF THEN OUTPUT;
%MEND TOTAL2;
*******************************************************************
*---- MACRO TOTAL3
*     MACRO TO SUM END STORE NATIONAL SPECIES TOTALS
*;
%MACRO TOTAL3(IFILE,TFILE,KEEP_VAR);
       DATA &TFILE; SET &IFILE END-EOF;
       ARRAY QASPEC SO2POL SO4POL NOXPOL COPOL HCLPOL HFPOL NH3POL
                   TSPPOL VOCPOL THCPOL QHC1 QHC2 QHC3 QHC4 QHC5 QHC6
                   QHC7 QHC8 QHC9 QHC10
                   QHC11 QHC12 QHC13 QHC14 QHC15 QHC16 QHC17 QHC18 QHC19
                   QHC20 QHC21 QHC22 QHC23 QHC24 QHC25 QHC26 QHC27 QHC28
                   QHC29 QHC30 QHC31 QHC32 QNO QNO2 QCA1 QCA2 QCA3 QMG1
                   QMG2 QMG3 QK1 QK2 QK3 QNA1 QNA2 QNA3 QPM1 QPM2 QPM3;
       ARRAY SPECIES SO2 SO4 NOX CO HCL HF NH3 TSP VOC THC
                   HC1 HC2 HC3 HC4 HC5 HC6 HC7 HC8 HC9 HC10
                   HC11 HC12 HC13 HC14 HC15 HC16 HC17 HC18 HC19
                   HC20 HC21 HC22 HC23 HC24 HC25 HC26 HC27 HC28
                   HC29 HC30 HC31 HC32 NO NO2 CA1 CA2 CA3 MG1
                   MG2 MG3 K1 K2 K3 NA1 NA2 NA3 PM1 PM2 PM3;
       RETAIN SO2--PM3;
       %&KEEP_VAR
       *
       *---- ZERO SUMS
       *;
       IF _N_-1 THEN DO OVER SPECIES;
          SPECIES-0;
       END;
       *
       *---- ACCUMULATE SUMS
       *;
       DO OVER SPECIES;
          SPECIES-SUM(SPECIES,QASPEC);
       END;
       *
       *---- OUTPUT
       *;
       IF EOF THEN OUTPUT;
%MEND TOTAL3;
*******************************************************************
```

```
*---- MACRO KEEPVARP
*     MACRO TO KEEP POINT SOURCE VARIABLES IN MACRO TOTAL3
*;
%MACRO KEEPVARP;
  KEEP STATE SCC SO2--PM3;
%MEND KEEPVARP;
***************************************************************
*---- MACRO KEEPVARA
*     MACRO TO KEEP AREA SOURCE VARIABLES IN MACRO TOTAL3
*;
%MACRO KEEPVARA;
  KEEP STATE SCC SO2--PM3;
%MEND KEEPVARA;
***************************************************************
*---- MACRO BYSUMS1(BY VARIABLE, INFILE, SORT FILE, OUTFILE)
*     MACRO TO CALCULATE BASLINE NATIONAL TOTALS BY BY_VAR
*;
%MACRO BYSUMS1(BY_VAR,IFILE,SORTED,OFILE);
       PROC SORT DATA=&IFILE OUT=&SORTED;
         BY &BY_VAR;
       DATA &OFILE; SET &SORTED;
         BY &BY_VAR;
         ARRAY POLL SO2POL SO4POL NOXPOL COPOL HCLPOL
                    HFPOL NH3POL TSPPOL VOCPOL THCPOL;
         ARRAY SPOLL SO2 SO4 NOX CO HCL HF NH3 TSP VOC THC;
         RETAIN SO2--THC;
         KEEP SO2--THC &BY_VAR;
         *
         *---- ZERO SUMS
         *;
         IF FIRST.&BY_VAR THEN DO OVER SPOLL;
           SPOLL=0;
         END;
         *
         *---- ACCUMULATE SUMS
         *;
         DO OVER SPOLL;
           SPOLL=SUM(SPOLL,POLL);
         END;
         *
         *---- OUTPUT
         *;
         IF LAST.&BY_VAR THEN OUTPUT;
%MEND BYSUMS1;
***************************************************************
*---- MACRO BYSUMS2(BY VARIABLE, INFILE, SORT FILE, OUTFILE)
*     MACRO TO SUM EMISSIONS BY BY_VAR AND STORE IN
*;
%MACRO BYSUMS2(BY_VAR,IFILE,SORTED,OFILE);
       PROC SORT DATA=&IFILE OUT=&SORTED;
         BY &BY_VAR;
       DATA &OFILE; SET &SORTED;
         BY &BY_VAR;
         ARRAY POLL SO2POL SO4POL NOXPOL COPOL HCLPOL
                    HFPOL NH3POL TSPPOL VOCPOL THCPOL;
         ARRAY QAPOLL QASO2 QASO4 QANOX QACO QAHCL
                      QAHF QANH3 QATSP QAVOC QATHC;
         RETAIN QASO2--QATHC;
         KEEP QASO2--QATHC &BY_VAR;
```

```
        *
        *---- ZERO SUMS
        *;
        IF FIRST.&BY_VAR THEN DO OVER QAPOLL;
          QAPOLL=0;
        END;
        *
        *---- ACCUMULATE SUMS
        *;
        DO OVER QAPOLL;
          QAPOLL=SUM(QAPOLL,POLL);
        END;
        *
        *---- OUTPUT
        *;
        IF LAST.&BY_VAR THEN OUTPUT;
%MEND BYSUMS2;
******************************************************************
*---- MACRO BYSUMS3(VARIABLE,INFILE,OUTFILE)
*     MACRO TO SUM EMISSIONS BY BY_VAR AND STORE IN
*     DATA SET FOR SUMS REPORT GENERATION
*;
%MACRO BYSUMS3(BY_VAR,IFILE,SORTED,OFILE);
       PROC SORT DATA=&IFILE OUT=&SORTED;
         BY &BY_VAR;
       DATA &OFILE; SET &SORTED;
         BY &BY_VAR;
         ARRAY POLL SO2POL SO4POL NOXPOL COPOL HCLPOL
                    HFPOL NH3POL TSPPOL VOCPOL THCPOL
                    QHC1 QHC2 QHC3 QHC4 QHC5 QHC6 QHC7 QHC8 QHC9 QHC10
                   QHC11 QHC12 QHC13 QHC14 QHC15 QHC16 QHC17 QHC18 QHC19
                   QHC20 QHC21 QHC22 QHC23 QHC24 QHC25 QHC26 QHC27 QHC28
                   QHC29 QHC30 QHC31 QHC32 QNO QNO2 QCA1 QCA2 QCA3 QMG1
                   QMG2 QMG3 QK1 QK2 QK3 QNA1 QNA2 QNA3 QPM1 QPM2 QPM3;
         ARRAY SUMPOL SO2 SO4 NOX CO HCL HF NH3 TSP VOC THC
                      HC1 HC2 HC3 HC4 HC5 HC6 HC7 HC8 HC9 HC10
                      HC11 HC12 HC13 HC14 HC15 HC16 HC17 HC18 HC19 HC20
                      HC21 HC22 HC23 HC24 HC25 HC26 HC27 HC28 HC29 HC30
                      HC31 HC32 NO NO2 CA1 CA2 CA3 MG1 MG2 MG3
                      K1 K2 K3 NA1 NA2 NA3 PM1 PM2 PM3;
         RETAIN SO2--PM3;
         KEEP SO2--PM3 &BY_VAR;
         *
         *---- ZERO SUMS
         *;
         IF FIRST.&BY_VAR THEN DO OVER SUMPOL;
           SUMPOL=0;
         END;
         *
         *---- ACCUMULATE SUMS
         *;
         DO OVER SUMPOL;
           SUMPOL=SUM(SUMPOL,POLL);
         END;
         *
         *---- OUTPUT
         *;
         IF LAST.&BY_VAR THEN OUTPUT;
%MEND BYSUMS3;
```

```
*******************************************************************
*---- MACRO COMPAREP
*     MACRO TO EXECUTE COMPARISON TO ORIGINAL BASELINE TOTALS
*     OR TO PREVIOUS MODULE OUTPUT TOTALS FOR POINT SOURCES
;
%MACRO COMPAREP(NNAT,ONAT,NSTA,OSTA,NSCC,OSCC);
  DATA &NNAT; SET &ONAT;
    %IF "&COMPARE"="NEW" %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
    %END;
  DATA &NSTA; SET &OSTA;
    %IF "&COMPARE"="NEW" %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
    %END;
  DATA &NSCC; SET &OSCC;
    %IF "&COMPARE"="NEW" %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
    %END;
%MEND COMPAREP;
*******************************************************************
*---- MACRO COMPAREA
*     MACRO TO EXECUTE COMPARISON TO ORIGINAL BASELINE TOTALS
*     OR TO PREVIOUS MODULE OUTPUT TOTALS FOR AREA SOURCES
;
%MACRO COMPAREA(NNAT,ONAT,NSTA,OSTA,NSCC,OSCC);
  DATA &NNAT; SET &ONAT;
    %IF "&COMPARE"="NEW" %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
    %END;
  DATA &NSTA; SET &OSTA;
    %IF "&COMPARE"="NEW" %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
    %END;
  DATA &NSCC; SET &OSCC;
   %IF "&COMPARE"="NEW" %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
   %END;
%MEND COMPAREA;
*******************************************************************
*---- MACRO PRNATION(NEW TOTAL FILE, OLD TOTAL FILE, REPORT FILE)
*     MACRO TO PRINT QA MESSAGES FOR NATIONAL TOTALS
*;
%MACRO PRNATION(FILE1,FILE2,RPTFILE);
  DATA _NULL_; MERGE &FILE1 &FILE2 END=EOF;
    ARRAY POLL SO2 SO4 NOX CO HCL
               HF NH3 TSP VOC THC;
    ARRAY QAPOLL QASO2 QASO4 QANOX QACO QAHCL
                 QAHF QANH3 QATSP QAVOC QATHC;
    ARRAY TOL TOL1-TOL10;
    ARRAY POLERR POLERR1-POLERR10;
    RETAIN ERRNUM POLERR1-POLERR10;
    TOL1=&TOL1; TOL2=&TOL2; TOL3=&TOL3; TOL4=&TOL4;
    TOL5=&TOL5; TOL6=&TOL6; TOL7=&TOL7; TOL8=&TOL8;
    TOL9=&TOL9; TOL10=&TOL10; STEP="&STEP";
    SOURCE="&SOURCE"; COUNTRY="&COUNTRY";
    IF _N_ = 1 THEN DO;
      ERRNUM=0;
      DO OVER POLERR;
        POLERR=0;
      END;
    END;
    FILE &RPTFILE PRINT HEADER=H NOTITLES;
    DO OVER POLL;
      DIFF=ROUND(ABS(POLL-QAPOLL),1);
      PCTDIFF=ROUND((DIFF/POLL)*100,0.01);
      POLL=ROUND(POLL,1); QAPOLL=ROUND(QAPOLL,1);
      IF DIFF > POLL*TOL THEN ERRNUM=ERRNUM+1;
      IF DIFF > POLL*TOL THEN POLERR=POLERR+1;
      IF DIFF > POLL*TOL AND ERRNUM <= &MAXPRINT
      THEN PUT ' ' // @2 SOURCE= @12 STEP= @21 'NATIONAL'
      @30 COUNTRY= @42 'ORIGINAL' @51 POLL= @66 QAPOLL=/
      @2 'DIFFERENCE=' @14 DIFF @23 'TONS' @30 '(' @31 PCTDIFF
      @37 'PERCENT OF ORIGINAL)' @61 TOL=/;
      ELSE IF DIFF <= POLL*TOL AND ERRNUM <= &MAXPRINT THEN
      PUT ' ' // @2 SOURCE= @12 STEP= @21 'NATIONAL'
      @30 COUNTRY= @42 POLL= @66 QAPOLL=/
      @2 'MEETS TOLERANCE, DIFFERENCE=' @30 DIFF @37 'TONS ('
      @45 PCTDIFF @51 '% OF ORIGINAL)' @66 TOL=/;
    END;
    IF EOF THEN PUT @2 80*'-'/
        @2 'TOTAL EXCEEDENCES OF ALL TOLERANCES ARE' @42 ERRNUM
       // @2 'TOTAL EXCEEDENCES, SO2:' @26 POLERR1
        / @21 'SO4:' @26 POLERR2
        / @21 'NOX:' @26 POLERR3
        / @21 'CO:'  @26 POLERR4
        / @21 'HCL:' @26 POLERR5
        / @21 'HF:'  @26 POLERR6
        / @21 'NH3:' @26 POLERR7
        / @21 'TSP:' @26 POLERR8
        / @21 'VOC:' @26 POLERR9
        / @21 'THC:' @26 POLERR10;
    RETURN;
    H:TDAY=DATE();
    PUT @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM' @70 TDAY MMDDYY8.
        / @2 'QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR'
        @54 'NATIONAL TOTALS'/
        @2 80*'-';
    RETURN;
%MEND PRNATION;
*******************************************************************
*---- MACRO PRNSTATE(NEW TOTAL FILE,OLD TOTAL FILE,REPORT FILE,BY VAR)
*     MACRO TO CREATE AND PRINT QA MESSAGES FOR STATE TOTALS
*;
%MACRO PRNSTATE(FILE1,FILE2,RPTFILE,BY_VAR);
  DATA _NULL_ ; MERGE &FILE1 &FILE2 END=EOF;
    BY &BY_VAR;
    ARRAY POLL SO2 SO4 NOX CO HCL
               HF NH3 TSP VOC THC;
    ARRAY QAPOLL QASO2 QASO4 QANOX QACO QAHCL
                 QAHF QANH3 QATSP QAVOC QATHC;
    ARRAY TOL TOL1-TOL10;
    ARRAY POLERR POLERR1-POLERR10;
    RETAIN ERRNUM POLERR1-POLERR10;
    TOL1-&TOL1; TOL2-&TOL2; TOL3-&TOL3; TOL4-&TOL4;
    TOL5-&TOL5; TOL6-&TOL6; TOL7-&TOL7; TOL8-&TOL8;
    TOL9-&TOL9; TOL10-&TOL10; STEP-"&STEP";
    SOURCE-"&SOURCE"; COUNTRY-"&COUNTRY";
    IF _N_ - 1 THEN DO;
      ERRNUM-0;
      DO OVER POLERR;
        POLERR-0;
      END;
    END;
    FILE &RPTFILE PRINT HEADER-H NOTITLES;
    DO OVER POLL;
      DIFF-ROUND(ABS(POLL-QAPOLL),1);
      PCTDIFF-ROUND((DIFF/POLL)*100,0.01);
      POLL-ROUND(POLL,1); QAPOLL-ROUND(QAPOLL,1);
      IF DIFF > POLL*TOL THEN ERRNUM-ERRNUM+1;
      IF DIFF > POLL*TOL THEN POLERR-POLERR+1;
      IF DIFF > POLL*TOL AND ERRNUM <- &MAXPRINT
      THEN PUT ' ' // @2 SOURCE- @12 STEP- @21 &BY_VAR-
               @35 COUNTRY- @47 POLL- @65 QAPOLL-/
      @2 'DIFFERENCE-' @14 DIFF @23 'TONS' @30 '(' @31 PCTDIFF
      @37 'PERCENT OF ORIGINAL)' @61 TOL-/;
    END;
    IF EOF THEN PUT @2 80*'-'/
        @2 'TOTAL EXCEEDENCES OF ALL TOLERANCES ARE' @42 ERRNUM
       // @2 'TOTAL EXCEEDENCES, SO2:' @26 POLERR1
         / @21 'SO4:' @26 POLERR2
         / @21 'NOX:' @26 POLERR3
         / @21 'CO:'  @26 POLERR4
         / @21 'HCL:' @26 POLERR5
         / @21 'HF:'  @26 POLERR6
         / @21 'NH3:' @26 POLERR7
         / @21 'TSP:' @26 POLERR8
         / @21 'VOC:' @26 POLERR9
         / @21 'THC:' @26 POLERR10;
    RETURN;
    H:TDAY-DATE();
    PUT @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM' @70 TDAY MMDDYY8.
        / @2 'QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR'
        @54 'STATE TOTALS'/
        @2 80*'-';
    RETURN;
%MEND PRNSTATE;
*******************************************************************
*---- MACRO PRNSCC(NEW TOTAL FILE,OLD TOTAL FILE,REPORT FILE, BY VAR)
*     MACRO TO CREATE AND PRINT QA MESSAGES FOR SCC TOTALS
*;
%MACRO PRNSCC(FILE1,FILE2,RPTFILE,BY_VAR);
  DATA _NULL_ ; MERGE &FILE1 &FILE2(IN-A) END-EOF;
    BY &BY_VAR; IF A;
    ARRAY POLL SO2 SO4 NOX CO HCL
               HF NH3 TSP VOC THC;
    ARRAY QAPOLL QASO2 QASO4 QANOX QACO QAHCL
                 QAHF QANH3 QATSP QAVOC QATHC;
    ARRAY TOL TOL1-TOL10;
    ARRAY POLERR POLERR1-POLERR10;
    RETAIN ERRNUM POLERR1-POLERR10;
    TOL1-&TOL1; TOL2-&TOL2; TOL3-&TOL3; TOL4-&TOL4;
    TOL5=&TOL5; TOL6=&TOL6; TOL7=&TOL7; TOL8=&TOL8;
    TOL9=&TOL9; TOL10=&TOL10; STEP="&STEP";
    SOURCE="&SOURCE"; COUNTRY="&COUNTRY";
    IF _N_ = 1 THEN DO;
      ERRNUM=0;
      DO OVER POLERR;
        POLERR=0;
      END;
    END;
    FILE &RPTFILE PRINT HEADER=H NOTITLES;
    DO OVER POLL;
      DIFF=ROUND(ABS(POLL-QAPOLL),1);
      PCTDIFF=ROUND((DIFF/POLL)*100,0.01);
      POLL=ROUND(POLL,1); QAPOLL=ROUND(QAPOLL,1);
      IF DIFF > POLL*TOL THEN ERRNUM=ERRNUM+1;
      IF DIFF > POLL*TOL THEN POLERR=POLERR+1;
      IF DIFF > POLL*TOL AND ERRNUM <= &MAXPRINT
      THEN PUT ' ' // @2 SOURCE= @12 STEP= @21 &BY_VAR=
             @35 COUNTRY= @47 POLL= @65 QAPOLL=/
      @2 'DIFFERENCE=' @14 DIFF @23 'TONS' @30 '(' @31 PCTDIFF
      @37 'PERCENT OF ORIGINAL)' @61 TOL=/;
    END;
    IF EOF THEN PUT @2 80*'-'/
        @2 'TOTAL EXCEEDENCES OF ALL TOLERANCES ARE' @42 ERRNUM
       // @2 'TOTAL EXCEEDENCES, SO2:' @26 POLERR1
        / @21 'SO4:' @26 POLERR2
        / @21 'NOX:' @26 POLERR3
        / @21 'CO:'  @26 POLERR4
        / @21 'HCL:' @26 POLERR5
        / @21 'HF:'  @26 POLERR6
        / @21 'NH3:' @26 POLERR7
        / @21 'TSP:' @26 POLERR8
        / @21 'VOC:' @26 POLERR9
        / @21 'THC:' @26 POLERR10;
    RETURN;
    H:TDAY=DATE();
    PUT @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM' @70 TDAY MMDDYY8.
        / @2 'QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR'
        @54 'SCC TOTALS'/
        @2 80*'-';
    RETURN;
%MEND PRNSCC;
*******************************************************************
*---- MACRO PRNTEMPP(TOLERANCE,FACTOR,FACTOR TYPE)
*     MACRO TO CREATE AND PRINT QA MESSAGES FOR
*     POINT SOURCE TEMPORAL ALLOCATION FACTORS
*;
%MACRO PRNTEMPP(TOLER,FACTOR=,TYPE=);
  DIFF=ABS(&FACTOR-1.000);
  IF DIFF > &TOLER THEN ERRNUM=ERRNUM+1;
  IF DIFF > &TOLER AND &TYPE='SEAS' THEN SEAERR=SEAERR+1;
  IF DIFF > &TOLER AND &TYPE='DAY'  THEN DAYERR=DAYERR+1;
  IF DIFF > &TOLER AND &TYPE='HOUR' THEN HOURERR=HOURERR+1;
  IF DIFF > &TOLER AND ERRNUM <= &MAXPRINT
  THEN PUT ' ' // @2
              SOURCE= @12 STEP= @21 COUNTRY= @33 &FACTOR= @49 &TOLER=/
           @2 'DIFFERENCE FROM 1.000 IS' @28 DIFF /
           @2 STATE= @12 COUNTY= @24 PLANT_ID= @39 POINT_ID= @51 SCC=/;
%MEND PRNTEMPP;
```

```
******************************************************************************
*---- MACRO QATEMP(INPUT FILE,REPORT FILE,AS OR PS MESSAGE)
*     MACRO TO QA SEASONAL, DAILY, AND HOURLY TEMPORAL FACTORS
*;
%MACRO QATEMP(IFILE,RPTFILE,PRNTEMP);
  DATA _NULL_; SET &IFILE END=EOF;
    ARRAY SEA SEA1-SEA12;
    ARRAY DAY DAY1-DAY12;
    ARRAY HOUR HOUR1-HOUR288;
    RETAIN QASEAWEK QASEASAT QASEASUN
             QADAYWIN QADAYSPR QADAYSUM QADAYFAL
             QAHOUR1-QAHOUR12 ERRNUM SEAERR DAYERR HOURERR;
    STEP="&STEP"; SOURCE="&SOURCE"; COUNTRY="&COUNTRY";
    SEATOL=&SEATOL; DAYTOL=&DAYTOL; HOURTOL=&HOURTOL;
    *
    *---- ZERO QA TOTALS
    *;
    QASEAWEK=0; QASEASAT=0; QASEASUN=0;
    QADAYWIN=0; QADAYSPR=0; QADAYSUM=0; QADAYWIN=0;
    %DO YY = 1 %TO 12;
      QAHOUR&YY=0;
    %END;
    *
    *---- SUM SEAONAL, DAILY, AND HOURLY FRACTIONS
    *;
    QASEAWEK=SEA1+SEA4+SEA7+SEA10;
    QASEASAT=SEA2+SEA5+SEA8+SEA11;
    QASEASUN=SEA3+SEA6+SEA9+SEA12;
    QADAYWIN=((DAY1*5)+DAY2+DAY3)*13;
    QADAYSPR=((DAY4*5)+DAY5+DAY6)*13;
    QADAYSUM=((DAY7*5)+DAY8+DAY9)*13;
    QADAYFAL=((DAY10*5)+DAY11+DAY12)*13;
    %DO YY = 1 %TO 12;
      %DO XX = ((&YY-1)*24)+1 %TO 24*&YY;
        QAHOUR&YY=QAHOUR&YY+HOUR&XX;
      %END;
    %END;
    *
    *---- PRINT QA MESSAGES FOR SEASONAL, DAILY, AND HOURLY FACTORS
    *;
    IF _N_ = 1 THEN DO;
       ERRNUM=0; SEAERR=0; DAYERR=0; HOURERR=0;
    END;
    FILE &RPTFILE PRINT HEADER=H NOTITLES;
    IF QASEAWEK > 0 THEN DO;
      %&PRNTEMP(SEATOL,FACTOR=QASEAWEK,TYPE='SEAS')
    END;
    IF QASEASAT > 0 THEN DO;
      %&PRNTEMP(SEATOL,FACTOR=QASEASAT,TYPE='SEAS')
    END;
    IF QASEASUN > 0 THEN DO;
      %&PRNTEMP(SEATOL,FACTOR=QASEASUN,TYPE='SEAS')
    END;
    %&PRNTEMP(DAYTOL,FACTOR=QADAYWIN,TYPE='DAY')
    %&PRNTEMP(DAYTOL,FACTOR=QADAYSPR,TYPE='DAY')
    %&PRNTEMP(DAYTOL,FACTOR=QADAYSUM,TYPE='DAY')
    %&PRNTEMP(DAYTOL,FACTOR=QADAYFAL,TYPE='DAY')
    %DO XX=1 %TO 12;
      IF DAY&XX > 0 THEN DO;
```

```
        %LET QAHOUR=QAHOUR&XX;
        %&PRNTEMP(HOURTOL,FACTOR=&QAHOUR,TYPE='HOUR')
      END;
    %END;
    IF EOF THEN PUT @2 80*'-'/
     // @2 'TOTAL EXCEEDENCES OF ALL TOLERANCES ARE' @42 ERRNUM
      / @2 'TOTAL EXCEEDENCES, SEASONAL:' @31 SEAERR
      / @21 'DAILY:' @31 DAYERR
      / @21 'HOURLY:' @31 HOURERR;
    RETURN;
    H:TDAY=DATE();
    PUT @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM' @70 TDAY MMDDYY8.
        @2 / 'QUALITY CONTROL MODULE DIAGNOSTIC ERROR LISTING FOR'
        @54 'TEMPORAL ALLOCATION FACTORS'/
        @2 80*'-';
    RETURN;
%MEND QATEMP;
*******************************************************************
*---- MACRO CONCATE
*     MACRO TO CONCATENATE SEVERAL DATA SETS INTO ONE
*;
%MACRO CONCATE(IFILE1,IFILE2,IFILE3,IFILE4,OFILE);
  DATA &OFILE; SET &IFILE1 &IFILE2 &IFILE3 &IFILE4;
    OUTPUT;
    RUN;
%MEND CONCATE;
*******************************************************************
*---- MACRO CONCATE2
*     MACRO TO CONCATENATE SEVERAL DATA SETS INTO ONE
*     AND RENAME POLLUTANTS
*;
%MACRO CONCATE2(IFILE1,IFILE2,IFILE3,IFILE4,OFILE);
  DATA &OFILE; SET &IFILE1 &IFILE2 &IFILE3 &IFILE4;
    RENAME QASO2=SO2POL QASO4=SO4POL QANOX=NOXPOL QACO=COPOL
           QAHCL=HCLPOL QAHF=HFPOL   QANH3=NH3POL QATSP=TSPPOL
           QAVOC=VOCPOL QATHC=THCPOL;
    RUN;
%MEND CONCATE2;
*******************************************************************
*---- MACRO WEIGHTED
*     MACRO TO MULTIPLY RESOLVED EMISSIONS BY WEIGHTING FACTORS
*;
%MACRO WEIGHTED(IFILE,OFILE,WEIGHT=);
  DATA &OFILE; SET &IFILE;
    ARRAY QAPOLL QASO2 QASO4 QANOX QACO  QAHCL
                 QAHF  QANH3 QATSP QAVOC QATHC;
    DO OVER QAPOLL;
      QAPOLL=QAPOLL*&WEIGHT;
    END;
%MEND WEIGHTED;
*******************************************************************
*---- MACRO ALLONEP
*     MACRO TO CREATE INITIAL BASELINE TOTALS IN PERMANENT SAS DATA
*     SETS TO USE IN SUBSEQUENT QA CHECKS FOR POINT SOURCES
*;
%MACRO ALLONEP;
  %SUBSETP1(ALLONEP.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL1(TEMP2.DATA,ALLTOTP.DATA)
  %BYSUMS1(STATE,TEMP2.DATA,SORTED.DATA,STATOTP.DATA)
  %BYSUMS1(SCC,TEMP2.DATA,SORTED.DATA,SCCTOTP.DATA)
%MEND ALLONEP;
*********************************************************************
*---- MACRO ALLONEA
*     MACRO TO CREATE INITIAL BASELINE TOTALS IN PERMANENT SAS DATA
*     SETS TO USE IN SUBSEQUENT QA CHECKS FOR AREA SOURCES
*;
%MACRO ALLONEA;
  %SUBSETA1(ALLONEA.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL1(TEMP2.DATA,ALLTOTA.DATA)
  %BYSUMS1(STATE,TEMP2.DATA,SORTED.DATA,STATOTA.DATA)
  %BYSUMS1(SCC,TEMP2.DATA,SORTED.DATA,SCCTOTA.DATA)
%MEND ALLONEA;
*********************************************************************
*---- MACRO ALLHCPP
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER HYDROCARBON
*     PREPROCESSOR FOR POINT SOURCES
*;
%MACRO ALLHCPP;
  %SUBSETP1(ALLHCPP.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- MERGE ORIGINAL TOTALS WITH HCPREP TOTALS AND CHECK TOLERANCE,
  *     PRINT REPORT FOR NATIONAL, STATE, AND SCC TOTALS
  *;
  %PRNATION(QAALL.DATA,ALLTOTP.DATA,REPORT1)
  %PRNSTATE(QASTA.DATA,STATOTP.DATA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,SCCTOTP.DATA,REPORT3,SCC)
%MEND ALLHCPP;
*********************************************************************
*---- MACRO ALLHCPA
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER HYDROCARBON
*     PREPROCESSOR FOR AREA SOURCES
*;
%MACRO ALLHCPA;
  %SUBSETA1(ALLHCPA.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- MERGE ORIGINAL TOTALS WITH HCPREP TOTAL AND CHECK TOLERANCE,
  *     PRINT REPORT FOR NATIONAL, STATE, AND SCC TOTALS
  *;
  %PRNATION(QAALL.DATA,ALLTOTA.DATA,REPORT1)
  %PRNSTATE(QASTA.DATA,STATOTA.DATA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,SCCTOTA.DATA,REPORT3,SCC)
%MEND ALLHCPA;
*********************************************************************
*---- MACRO ALLMDMP
```

```
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER MODEL DATA
*     EXTRACTION MODULE FOR POINT SOURCES
*;
%MACRO ALLMDMP;
  %SUBSETP1(ALLMDMP.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- MERGE ORIGINAL TOTALS WITH MDEM TOTALS AND CHECK TOLERANCE,
  *     PRINT REPORT FOR NATIONAL, STATE, AND SCC TOTALS
  *;
  %COMPAREP(TMPNAT,ALLTOTP.DATA,TMPSTA,STATOTP.DATA,TMPSCC,SCCTOTP.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND ALLMDMP;
*******************************************************************
*---- MACRO ALLMDMA
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER MODEL DATA
*     EXTRACTION MODULE FOR AREA SOURCES
*;
%MACRO ALLMDMA;
  %SUBSETA2(TEMP2.DATA)
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- MERGE ORIGINAL TOTALS WITH MDEM TOTALS AND CHECK TOLERANCE,
  *     PRINT REPORT FOR NATIONAL, STATE, AND SCC TOTALS
  *;
  %COMPAREA(TMPNAT,ALLTOTA.DATA,TMPSTA,STATOTA.DATA,TMPSCC,SCCTOTA.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND ALLMDMA;
*******************************************************************
*---- MACRO ALLSPMP
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER SPECIATION
*     MODULE FOR POINT SOURCES
*;
%MACRO ALLSPMP;
  %SUBSETP1(ALLSPMP.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION, STATE, SCC, AND SPECIES
  *;
  %COMPAREP(TMPNAT,ALLTOTP.DATA,TMPSTA,STATOTP.DATA,TMPSCC,SCCTOTP.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND ALLSPMP;
**************************************************************
*---- MACRO ALLSPMA
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER SPECIATION
*     MODULE FOR AREA SOURCES
*;
%MACRO ALLSPMA;
  %SUBSETA2(TEMP2.DATA)
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION, STATE, SCC, AND SPECIES
  *;
  %COMPAREA(TMPNAT,ALLTOTA.DATA,TMPSTA,STATOTA.DATA,TMPSCC,SCCTOTA.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND ALLSPMA;
**************************************************************
*---- MACRO ALLSAMP
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER SPATIAL ALLOCATION
*     MODULE FOR POINT SOURCES
*;
%MACRO ALLSAMP;
  %SUBSETP1(ALLSAMP.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION, STATE, SCC, AND SPECIES
  *;
  %COMPAREP(TMPNAT,ALLTOTP.DATA,TMPSTA,STATOTP.DATA,TMPSCC,SCCTOTP.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND ALLSAMP;
**************************************************************
*---- MACRO USASAMA
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER SPATIAL ALLOCATION
*     MODULE FOR U.S. AREA SOURCES
*;
%MACRO USASAMA;
  %SUBSETA4(THCSAMA1.DATA,TSPSAMA1.DATA,TEMP2.DATA)
  %TOTAL2(TEMP2.DATA,TEMP7)
  %BYSUMS2(STATE,TEMP2.DATA,TEMP2A.DATA,TEMP12)
  %SUBSCC(TEMP2.DATA,TEMP17.DATA)
  %BYSUMS2(SCC,TEMP17.DATA,TEMP2B.DATA,TEMP17.DATA)
  %SUBSETA4(THCSAMA2.DATA,TSPSAMA2.DATA,TEMP2.DATA)
  %TOTAL2(TEMP2.DATA,TEMP8)
  %BYSUMS2(STATE,TEMP2.DATA,TEMP2C.DATA,TEMP13)
  %SUBSCC(TEMP2.DATA,TEMP18.DATA)
  %BYSUMS2(SCC,TEMP18.DATA,TEMP2D.DATA,TEMP18.DATA)
  DATA TEMP11; SET TEMP7 TEMP8;
    RENAME QASO2-SO2POL QASO4-SO4POL QANOX-NOXPOL QACO-COPOL
           QAHCL-HCLPOL QAHF-HFPOL   QANH3-NH3POL QATSP-TSPPOL
           QAVOC-VOCPOL QATHC-THCPOL;
  %TOTAL2(TEMP11,QAALL.DATA)
  DATA TEMP11; SET TEMP12 TEMP13;
    RENAME QASO2-SO2POL QASO4-SO4POL QANOX-NOXPOL QACO-COPOL
           QAHCL-HCLPOL QAHF-HFPOL   QANH3-NH3POL QATSP-TSPPOL
           QAVOC-VOCPOL QATHC-THCPOL;
  %BYSUMS2(STATE,TEMP11,SORTED,QASTA.DATA)
  DATA TEMP11; SET TEMP17.DATA TEMP18.DATA;
    RENAME QASO2-SO2POL QASO4-SO4POL QANOX-NOXPOL QACO-COPOL
           QAHCL-HCLPOL QAHF-HFPOL   QANH3-NH3POL QATSP-TSPPOL
           QAVOC-VOCPOL QATHC-THCPOL;
  %BYSUMS2(SCC,TEMP11,SORTED,QASCC.DATA)
  %COMPAREA(TMPNAT,ALLTOTA.DATA,TMPSTA,STATOTA.DATA,TMPSCC,SCCTOTA.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND USASAMA;
*********************************************************************
*---- MACRO CANSAMA
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER SPATIAL ALLOCATION
*     MODULE FOR CANADIAN AREA SOURCES
*;
%MACRO CANSAMA;
  %SUBSETA4(THCSAMA1.DATA,TSPSAMA1.DATA,TEMP2.DATA)
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION, STATE, SCC, AND SPECIES
  *;
  %COMPAREA(TMPNAT,ALLTOTA.DATA,TMPSTA,STATOTA.DATA,TMPSCC,SCCTOTA.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND CANSAMA;
*********************************************************************
*---- MACRO ALLTAMP
*     MACRO TO CREATE NATIONAL, STATE, AND SCC TOTALS TO QA
*     AGAINST ORIGINAL BASELINE TOTALS AFTER TEMPORAL ALLOCATION
*     MODULE FOR POINT SOURCES, ALSO PERFORMS CHECK ON
*     TEMPORAL ALLOCATION FACTORS
*;
%MACRO ALLTAMP;
  %SUBSETP1(ALLTAMP.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION, STATE, SCC, SPECIES, AND TEMPORAL FACTORS
  *;
  %COMPAREP(TMPNAT,ALLTOTP.DATA,TMPSTA,STATOTP.DATA,TMPSCC,SCCTOTP.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
  %QATEMP(ALLTAMP.DATA,REPORT5,PRNTEMPP)
%MEND ALLTAMP;
******************************************************************
*---- MACRO USATAMA
*     MACRO TO CREATE NATIONAL TOTALS TO QA AGAINST ORIGINAL
*     BASELINE TOTALS AFTER TEMPORAL ALLOCATION MODULE FOR
*     U.S. AREA SOURCES
*;
%MACRO USATAMA;
  %DO XX=0 %TO 1;
    %DO YY=%EVAL(&XX * 12) + 1 %TO %EVAL(12*(&XX + 1));
      %SUBSETA5(THCTAM&YY..DATA,TSPTAM&YY..DATA,TEMP2.DATA)
      %LET WW = %EVAL(&YY + 14);
      %TOTAL2(TEMP2.DATA,TEMP&WW)
    %END;
    %DO UU=0 %TO 3;
      %LET WEK = %EVAL(&UU * 3 + 15 + &XX * 12);
      %LET SAT = %EVAL(&UU * 3 + 16 + &XX * 12);
      %LET SUN = %EVAL(&UU * 3 + 17 + &XX * 12);
      %WEIGHTED(TEMP&WEK,TEMP&WEK.W,WEIGHT=65)
      %WEIGHTED(TEMP&SAT,TEMP&SAT.W,WEIGHT=13)
      %WEIGHTED(TEMP&SUN,TEMP&SUN.W,WEIGHT=13)
    %END;
    %DO VV=0 %TO 2;
      %LET WW = %EVAL(&XX * 3 + 80 + &VV);
      %LET CCA = %EVAL(&VV * 4 + 15 + &XX * 12);
      %LET CCB = %EVAL(&VV * 4 + 16 + &XX * 12);
      %LET CCC = %EVAL(&VV * 4 + 17 + &XX * 12);
      %LET CCD = %EVAL(&VV * 4 + 18 + &XX * 12);
      %CONCATE(TEMP&CCA.W,TEMP&CCB.W,TEMP&CCC.W,TEMP&CCD.W,TEMP&WW)
    %END;
  %END;
  %CONCATE2(TEMP80,TEMP81,TEMP82,TEMP83,TEMP96)
  DATA TEMP97; SET TEMP84 TEMP85;
    RENAME QASO2=SO2POL QASO4=SO4POL QANOX=NOXPOL QACO=COPOL
           QAHCL=HCLPOL QAHF=HFPOL   QANH3=NH3POL QATSP=TSPPOL
           QAVOC=VOCPOL QATHC=THCPOL;
  DATA TEMP99; SET TEMP96 TEMP97;
    OUTPUT; RUN;
  %TOTAL2(TEMP99,QAALL.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION
  *;
  DATA TMPNAT; SET ALLTOTA.DATA;
    %IF COMPARE='NEW' %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
      %END;
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
```

```
%MEND USATAMA;
*******************************************************************
*---- MACRO CANTAMA
*     MACRO TO CREATE NATIONAL TOTALS TO QA AGAINST ORIGINAL
*     BASELINE TOTALS AFTER TEMPORAL ALLOCATION MODULE FOR
*     CANADIAN AREA SOURCES
*;
%MACRO CANTAMA;
  %DO XX=0 %TO 1;
    %DO YY=%EVAL(&XX * 12) + 1 %TO %EVAL(12*(&XX + 1));
      %SUBSETA5(THCTAM&YY..DATA,TSPTAM&YY..DATA,TEMP2.DATA)
      %LET WW = %EVAL(&YY + 14);
      %TOTAL2(TEMP2.DATA,TEMP&WW)
    %END;
    %DO UU=0 %TO 3;
      %LET WEK = %EVAL(&UU * 3 + 15 + &XX * 12);
      %LET SAT = %EVAL(&UU * 3 + 16 + &XX * 12);
      %LET SUN = %EVAL(&UU * 3 + 17 + &XX * 12);
      %WEIGHTED(TEMP&WEK,TEMP&WEK.W,WEIGHT=65)
      %WEIGHTED(TEMP&SAT,TEMP&SAT.W,WEIGHT=13)
      %WEIGHTED(TEMP&SUN,TEMP&SUN.W,WEIGHT=13)
    %END;
    %DO VV=0 %TO 2;
      %LET WW = %EVAL(&XX * 3 + 80 + &VV);
      %LET CCA = %EVAL(&VV * 4 + 15 + &XX * 12);
      %LET CCB = %EVAL(&VV * 4 + 16 + &XX * 12);
      %LET CCC = %EVAL(&VV * 4 + 17 + &XX * 12);
      %LET CCD = %EVAL(&VV * 4 + 18 + &XX * 12);
      %CONCATE(TEMP&CCA.W,TEMP&CCB.W,TEMP&CCC.W,TEMP&CCD.W,TEMP&WW)
    %END;
  %END;
  %CONCATE2(TEMP80,TEMP81,TEMP82,TEMP83,TEMP96)
  DATA TEMP97; SET TEMP84 TEMP85;
    RENAME QASO2=SO2POL QASO4=SO4POL QANOX=NOXPOL QACO=COPOL
           QAHCL=HCLPOL QAHF=HFPOL   QANH3=NH3POL QATSP=TSPPOL
           QAVOC=VOCPOL QATHC=THCPOL;
  DATA TEMP99; SET TEMP96 TEMP97;
    OUTPUT; RUN;
  %TOTAL2(TEMP99,QAALL.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION
  *;
  DATA TMPNAT; SET ALLTOTA.DATA;
    %IF COMPARE='NEW' %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
      %END;
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
%MEND CANTAMA;
********************************************************************
*---- MACRO ALLMIPP
*     MACRO TO CREATE NATIONAL TOTALS TO QA AGAINST ORIGINAL
*     BASELINE TOTALS AFTER MODEL INPUT PREPROCESSOR FOR
*     POINT SOURCES
*;
%MACRO ALLMIPP;
  %SUBSETP1(ALLMIPP.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL2(TEMP2.DATA,QAALL.DATA)
  %BYSUMS2(STATE,TEMP2.DATA,SORTED.DATA,QASTA.DATA)
  %SUBSCC(TEMP2.DATA,TEMP3.DATA)
  %BYSUMS2(SCC,TEMP3.DATA,SORTED.DATA,QASCC.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION, STATE, AND SCC
  *;
  %COMPAREP(TMPNAT,ALLTOTP.DATA,TMPSTA,STATOTP.DATA,TMPSCC,SCCTOTP.DATA)
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
  %PRNSTATE(QASTA.DATA,TMPSTA,REPORT2,STATE)
  %PRNSCC(QASCC.DATA,TMPSCC,REPORT3,SCC)
%MEND ALLMIPP;
*******************************************************************
*---- MACRO ALLMIPA
*     MACRO TO CREATE NATIONAL TOTALS TO QA AGAINST ORIGINAL
*     BASELINE TOTALS AFTER MODEL INPUT PREPROCESSOR FOR
*     AREA SOURCES
*;
%MACRO ALLMIPA;
  %DO XX=0 %TO 1;
    %DO YY=%EVAL(&XX * 12) + 1 %TO %EVAL(12*(&XX + 1));
      %SUBSETA5(THCMIP&YY..DATA,TSPMIP&YY..DATA,TEMP2.DATA)
      %LET WW = %EVAL(&YY + 14);
      %TOTAL2(TEMP2.DATA,TEMP&WW)
    %END;
    %DO UU=0 %TO 3;
      %LET WEK = %EVAL(&UU * 3 + 15 + &XX * 12);
      %LET SAT = %EVAL(&UU * 3 + 16 + &XX * 12);
      %LET SUN = %EVAL(&UU * 3 + 17 + &XX * 12);
      %WEIGHTED(TEMP&WEK,TEMP&WEK.W,WEIGHT=65)
      %WEIGHTED(TEMP&SAT,TEMP&SAT.W,WEIGHT=13)
      %WEIGHTED(TEMP&SUN,TEMP&SUN.W,WEIGHT=13)
    %END;
    %DO VV=0 %TO 2;
      %LET WW = %EVAL(&XX * 3 + 80 + &VV);
      %LET CCA = %EVAL(&VV * 4 + 15 + &XX * 12);
      %LET CCB = %EVAL(&VV * 4 + 16 + &XX * 12);
      %LET CCC = %EVAL(&VV * 4 + 17 + &XX * 12);
      %LET CCD = %EVAL(&VV * 4 + 18 + &XX * 12);
      %CONCATE(TEMP&CCA.W,TEMP&CCB.W,TEMP&CCC.W,TEMP&CCD.W,TEMP&WW)
    %END;
  %END;
  %CONCATE2(TEMP80,TEMP81,TEMP82,TEMP83,TEMP96)
  DATA TEMP97; SET TEMP84 TEMP85;
    RENAME QASO2=SO2POL QASO4=SO4POL QANOX=NOXPOL QACO=COPOL
           QAHCL=HCLPOL QAHF=HFPOL   QANH3=NH3POL QATSP=TSPPOL
           QAVOC=VOCPOL QATHC=THCPOL;
  DATA TEMP99; SET TEMP96 TEMP97;
    OUTPUT; RUN;
  %TOTAL2(TEMP99,QAALL.DATA)
  *
  *---- CHECK CALCULATED TOTALS AGAINST ORIGINAL TOTALS FOR
  *     NATION
  *;
  DATA TMPNAT; SET ALLTOTA.DATA;
    %IF COMPARE="NEW" %THEN %DO;
      RENAME QASO2=SO2 QASO4=SO4 QANOX=NOX QACO=CO QAHCL=HCL
             QAHF=HF QANH3=NH3 QATSP=TSP QAVOC=VOC QATHC=THC;
      %END;
  %PRNATION(QAALL.DATA,TMPNAT,REPORT1)
%MEND ALLMIPA;
**********************************************************************
*---- MACRO ALLSMAP
*     MACRO TO GENERATE NATIONAL, SCC, STATE, AND REGION-LEVEL
*     SUMS FOR ANNUAL POINT SOURCES TO BE USED IN EMISSIONS
*     TABLE CREATION
*;
%MACRO ALLSMAP;
  %SUBSETP1(ALLSMAP.DATA,TEMP2.DATA)
    SCC = FLOOR(SCC/100);
  %POLLNAME
  %TOTAL1(TEMP2.DATA,SUMOUT.NATION)
  %BYSUMS1(SCC,TEMP2.DATA,SORTED.DATA,SUMOUT.SCC)
  %BYSUMS1(STATE,TEMP2.DATA,SORTED.DATA,SUMOUT.STATE)
  DATA REG_ST; INFILE REGIONS;
    INPUT @1 REGION 2. STATE 3.;
  PROC SORT DATA=REG_ST;
    BY STATE;
  DATA TEMP_REG;
    DROP STATE;
    RENAME SO2=SO2POL SO4=SO4POL NOX=NOXPOL CO=COPOL HCL=HCLPOL
           HF=HFPOL NH3=NH3POL TSP=TSPPOL VOC=VOCPOL THC=THCPOL;
    MERGE SUMOUT.STATE(IN=THERE) REG_ST;
      BY STATE;
    IF THERE;
  %BYSUMS1(REGION,TEMP_REG,SORTED.DATA,SUMOUT.REGION)
%MEND ALLSMAP;
**********************************************************************
*---- MACRO ALLSMAA
*     MACRO TO GENERATE NATIONAL, SCC, AND STATE-LEVEL
*     SUMS FOR ANNUAL AREA SOURCES TO BE USED IN EMISSIONS
*     TABLE CREATION
*;
%MACRO ALLSMAA;
  %SUBSETA1(ALLSMAA.DATA,TEMP2.DATA)
  %POLLNAME
  %TOTAL1(TEMP2.DATA,SUMOUT.NATION)
  %BYSUMS1(SCC,TEMP2.DATA,SORTED.DATA,SUMOUT.SCC)
  %BYSUMS1(STATE,TEMP2.DATA,SORTED.DATA,SUMOUT.STATE)
  DATA REG_ST; INFILE REGIONS;
    INPUT @1 REGION 2. STATE 3.;
  PROC SORT DATA=REG_ST;
    BY STATE;
  DATA TEMP_REG;
    DROP STATE;
    RENAME SO2=SO2POL SO4=SO4POL NOX=NOXPOL CO=COPOL HCL=HCLPOL
           HF=HFPOL NH3=NH3POL TSP=TSPPOL VOC=VOCPOL THC=THCPOL;
    MERGE SUMOUT.STATE(IN=THERE) REG_ST;
      BY STATE;
    IF THERE;
  %BYSUMS1(REGION,TEMP_REG,SORTED.DATA,SUMOUT.REGION)
%MEND ALLSMAA;
**********************************************************************
*---- MACRO ALLSMRP
*     MACRO TO GENERATE NATIONAL, SCC, STATE, AND REGION-LEVEL
*     SUMS FOR SPECIATED POINT SOURCES TO BE USED IN EMISSIONS
*     TABLE CREATION
*     NOTE: SCC CONVERTED TO 6 DIGITS
*;
%MACRO ALLSMRP;
  %SUBSETP2(ALLSMRP.DATA,TEMP2.DATA)
  %POLLNAME
  %SPECNAME
  %TOTAL3(TEMP2.DATA,SUMOUT.NATION,KEEPVARP)
  %BYSUMS3(SCC,TEMP2.DATA,SORTED.DATA,SUMOUT.SCC)
  %BYSUMS3(STATE,TEMP2.DATA,SORTED.DATA,SUMOUT.STATE)
  DATA REG_ST; INFILE REGIONS;
    INPUT @1 REGION 2. STATE 3.;
  PROC SORT DATA-REG_ST;
    BY STATE;
  DATA TEMP_REG;
    DROP STATE;
    RENAME SO2-SO2POL SO4-SO4POL NOX-NOXPOL CO-COPOL HCL-HCLPOL
           HF-HFPOL NH3-NH3POL TSP-TSPPOL VOC-VOCPOL THC-THCPOL
           HC1-QHC1 HC2-QHC2 HC3-QHC3 HC4-QHC4 HC5-QHC5 HC6-QHC6
           HC7-QHC7 HC8-QHC8 HC9-QHC9 HC10-QHC10 HC11-QHC11 HC12-QHC12
           HC13-QHC13 HC14-QHC14 HC15-QHC15 HC16-QHC16 HC17-QHC17
           HC18-QHC18 HC19-QHC19 HC20-QHC20 HC21-QHC21 HC22-QHC22
           HC23-QHC23 HC24-QHC24 HC25-QHC25 HC26-QHC26 HC27-QHC27
           HC28-QHC28 HC29-QHC29 HC30-QHC30 HC31-QHC31 HC32-QHC32
           NO-QNO NO2-QNO2 CA1-QCA1 CA2-QCA2 CA3-QCA3 MG1-QMG1
           MG2-QMG2 MG3-QMG3 K1-QK1 K2-QK2 K3-QK3 NA1-QNA1 NA2-QNA2
           NA3-QNA3 PM1-QPM1 PM2-QPM2 PM3-QPM3;
    MERGE SUMOUT.STATE(IN-THERE) REG_ST;
      BY STATE;
    IF THERE;
  %BYSUMS3(REGION,TEMP_REG,SORTED.DATA,SUMOUT.REGION)
%MEND ALLSMRP;
*****************************************************************
*---- MACRO ALLSMRA
*     MACRO TO GENERATE NATIONAL, SCC, AND STATE-LEVEL EMISSIONS
*     SUMS FOR SPECIATED AREA SOURCES TO BE USED IN EMISSIONS
*     TABLE CREATION
*;
%MACRO ALLSMRA;
  %SUBSETA3(ALLSMRA1.DATA,ALLSMRA2.DATA,TEMP2.DATA)
  %TOTAL3(TEMP2.DATA,SUMOUT.NATION,KEEPVARA)
  %BYSUMS3(SCC,TEMP2.DATA,SORTED.DATA,SUMOUT.SCC)
  %BYSUMS3(STATE,TEMP2.DATA,SORTED.DATA,SUMOUT.STATE)
  DATA REG_ST; INFILE REGIONS;
    INPUT @1 REGION 2. STATE 3.;
  PROC SORT DATA-REG_ST;
    BY STATE;
  DATA TEMP_REG;
    DROP STATE;
    RENAME SO2-SO2POL SO4-SO4POL NOX-NOXPOL CO-COPOL HCL-HCLPOL
           HF-HFPOL NH3-NH3POL TSP-TSPPOL VOC-VOCPOL THC-THCPOL
           HC1-QHC1 HC2-QHC2 HC3-QHC3 HC4-QHC4 HC5-QHC5 HC6-QHC6
           HC7-QHC7 HC8-QHC8 HC9-QHC9 HC10-QHC10 HC11-QHC11 HC12-QHC12
           HC13-QHC13 HC14-QHC14 HC15-QHC15 HC16-QHC16 HC17-QHC17
           HC18-QHC18 HC19-QHC19 HC20-QHC20 HC21-QHC21 HC22-QHC22
           HC23-QHC23 HC24-QHC24 HC25-QHC25 HC26-QHC26 HC27-QHC27
           HC28-QHC28 HC29-QHC29 HC30-QHC30 HC31-QHC31 HC32-QHC32
           NO-QNO NO2-QNO2 CA1-QCA1 CA2-QCA2 CA3-QCA3 MG1-QMG1
           MG2-QMG2 MG3-QMG3 K1-QK1 K2-QK2 K3-QK3 NA1-QNA1 NA2-QNA2
           NA3-QNA3 PM1-QPM1 PM2-QPM2 PM3-QPM3;
    MERGE SUMOUT.STATE(IN=THERE) REG_ST;
      BY STATE;
    IF THERE;
  %BYSUMS3(REGION,TEMP_REG,SORTED.DATA,SUMOUT.REGION)
%MEND ALLSMRA;
******************************************************************
*---- MACRO ALLALLP
*     MACRO TO RUN ALL INDIVIDUAL QA STEPS FOR POINT SOURCES
*;
%MACRO ALLALLP;
  %ALLMDMP
  COUNTRY="CAN"; CALL SYMPUT("COUNTRY",COUNTRY); RUN;
  %ALLMDMP
  SOURCE="A"; CALL SYMPUT("SOURCE",SOURCE); RUN;
  %ALLMDMA
  COUNTRY="USA"; CALL SYMPUT("COUNTRY",COUNTRY); RUN;
  %ALLMDMA
%MEND ALLALLP;
******************************************************************
*---- MACRO ALLALLA
*     MACRO TO RUN ALL INDIVIDUAL QA STEPS FOR AREA SOURCES
*;
%MACRO ALLALLA;
  %ALLONEA
  STEP="HCP";
  CALL SYMPUT("STEP",STEP);
  RUN;
  %ALLHCPA
%MEND ALLALLA;
******************************************************************
****               END OF MACRO DEFINITIONS                   ****
******************************************************************
*;
%READCOF
```

APPENDIX C

MODEL DATA EXTRACTION MODULE

```
OPTIONS DQUOTE ;
*----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM:  MODEL DATA EXTRACTION MODULE (MDEM) - POINT SOURCES

  LANGUAGE: SAS(VERSION 5.16)

  PURPOSE: TO EXTRACT DATA FROM THE NAPAP ANNUAL EMISSIONS FILE FOR
           FREDS PROCESSING.  MDEM WILL:

               1. DROP EXTRANEOUS VARIABLES.
               2. CREATE INDUSTRY-SPECIFIC EMISSION SUBFILES BASED
                  ON SIC-SCC COMBINATIONS AND, FOR POINT SOURCES,
                  MAJOR-MINOR EMISSION LIMITS.
               3. PROVIDE A REPORT ON PROCESSING ACTIVITIES.

  VARIABLE LIST:  CONTROL OPTIONS FILE

 NAME          ROUTINE                DESCRIPTION
 ===============================================================
 DETAIL         MAIN       LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
 INDX1          MAIN       NUMBER OF TYPE 1 RECORDS (RUN IDENT.)
 INDX2          MAIN       NUMBER OF TYPE 2 RECORDS (SIC-SCC)
 INDX3          MAIN       NUMBER OF TYPE 3 RECORDS (MAJOR-MINOR)
 LIM_TH1-15     MAIN       EMISSION THRESHOLDS FOR MAJ-MIN SOURCES
 LIM_ID1-15     MAIN       SAROAD CODES FOR MAJOR-MINOR SOURCES
 RUN_ID         MAIN       RUN IDENTIFICATION HEADER
 SUBSCC1-50     MAIN       SCC CODES FOR INDUSTRY SUBFILES
 SUBSIC1-50     MAIN       SIC CODES FOR INDUSTRY SUBFILES
 SUBDD1-50      MAIN       JCL LABELS FOR SIC-SCC SUBFILES
 SOURCE         MAIN       EMISSIONS FILE TYPE
 TYPE           MAIN       CONTROL OPTION RECORD TYPE

  VARIABLE LIST:  EMISSIONS FILES

 NAME          ROUTINE                DESCRIPTION
 ===============================================================
 AQCR           EMISIN     AQCR
 COUNTY         EMISIN     COUNTY CODE
 CONEFF1-15     EMISIN     CONTROL EFFICIENCY
 DAYS           EMISIN     DAYS PER WEEK OPERATIONAL
 SCC            EMISIN     SCC CODE
 SIC            EMISIN     SIC CODE
 EMISS1-15      EMISIN     EMISSIONS FOR POLLUTANTS (TONS/YR)
 ESTMET1-15     EMISIN     ESTIMATION METHOD
 FALTHRU        EMISIN     FAL THRUPUT PERCENTAGE
 FLOW           EMISIN     EXHAUST GAS FLOWRATE (FT3/MIN)
 HOURS          EMISIN     HOURS PER DAY OPERATIONAL
 LAT            EMISIN     FRACTIONAL LATITUDE
 LON            EMISIN     FRACTIONAL LONGITUDE
 LAT_DEG        UNUSED     DEGREES LATITUDE
 LAT_MIN        UNUSED     MINUTES LATITUDE
 LAT_SEC        UNUSED     SECONDS LATITUDE
 LON_DEG        UNUSED     DEGREES LONGITUDE
 LON_MIN        UNUSED     MINUTES LONGITUDE
 LON_SEC        UNUSED     SECONDS LONGITUDE
 MAJOR          EMISIN     MAJOR POINT SOURCE FLAG
```

NUMPOLL	EMISIN	NUMBER OF POLLUTANTS ON EMISSIONS RECORD
PLANT_ID	EMISIN	PLANT IDENTIFICATION
PLUME_HT	EMISIN	PLUME HEIGHT (FT)
POINT_ID	EMISIN	POINT IDENTIFICATION
REC_DATE	EMISIN	YEAR OF RECORD
SAROAD1-15	EMISIN	POLLUTANT CODES (UP TO 15 POLLUTANTS)
SOURCE	EMISIN	POINT SOURCE RECORD FLAG
SPRTHRU	EMISIN	SPRING THRUPUT PERCENTAGE
STACK_DI	EMISIN	STACK DIAMETER (FT)
STACK_HT	EMISIN	STACK HEIGHT (FT)
STACK_TP	EMISIN	STACK TEMPERATURE (F)
STATE	EMISIN	STATE CODE
SUMTHRU	EMISIN	SUMMER THRUPUT PERCENTAGE
UTM_ZONE	EMISIN	UTM ZONE OF PLANT
UTMX	EMISIN	UTM HORIZONTAL COORDINATE
UTMY	EMISIN	UTM VERTICAL COORDINATE
VELOCITY	EMISIN	EXHAUST GAS VELOCITY
WEEKS	EMISIN	WEEKS PER YEAR OPERATIONAL
WINTHRU	EMISIN	WINTER HTRUPUT PERCENTAGE

VARIABLE LIST: GENERAL

NAME	ROUTINE	DESCRIPTION
AB	SETUP	COUNTER FOR SIC/SCC MACRO VARIABLES
B	EMISIN	STRING VARIABLE FOR JCL DD LABEL (N.A OR P)
BA	SETUP	COUNTER FOR LIMIT MACRO VARIABLES
DEL_CNT	EMISIN	ZERO EMISSIONS DELETED COUNTER
DT	MAIN	DATE OF DIAGNOSTIC REPORT
I	EMISIN	INDEX FOR SUBFILE CREATION
_I_	EMISIN	INDEX FOR SEARCH AND REPORT ARRAYS
LIM_TH	SETUP	EMISSION THRESHOLDS FOR MAJ-MIN SOURCES
MAXFILE	EMISIN	NUMBER OF INDUSTRY SUBFILES
ORDER	SORTEM	SORT ORDER OF SUBFILES
REC_CNT	EMISIN	EMISSIONS INPUT RECORD COUNTER
RUNCOL	MAIN	COLUMN TO CENTER RUN_ID IN DIAGNOSTIC REPORT
TM	MAIN	TIME OF DIAGNOSTIC REPORT
X	SORTEM,DETAIL	FILE COUNTER AND LOOP INDEX
Y	MAIN	START INDEX OF COF VARIABLES IN REPORT
Z	MAIN	END INDEX OF COF VARIABLES IN REPORT

ERROR HANDLING:

INPUT DATA FROM THE CONTROL OPTION FILE IS CHECKED FOR VALIDITY. THE DATA FROM THE ANNUAL EMISSIONS FILE HAS BEEN QUALITY ASSURED PRIOR TO INPUT TO MDEM. TWO TYPES OF ERRORS MAY OCCUR:

1. FATAL: EXECUTION OF MDEM IS TERMINATED.
2. WARNING: USER IS NOTIFIED OF OCCURRENCE BUT PROGRAM CONTINUES EXECUTION.

CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

METHOD: MDEM READS THE CONTROL FILE, CREATES SAS MACRO VARIABLES FROM THE CONTROL DATA AND CALLS THE EMISSIONS INPUT ROUTINE TO CREATE THE EMISSION SUBFILES AND PRODUCE A DIAGNOSTIC REPORT.

PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, JUNE 1985
MODIFIED: LYSA LEBOWITZ, ALLIANCE TECHNOLOGIES CORPORATION,

```
             ACCEPTS PREPROCESSED SAS POINT SOURCE FILE.
             SEPTEMBER 1987
   MODIFIED: DANIEL DULLEBA, ALLIANCE TECHNOLOGIES CORP., JANUARY 1988
             WEEKS=0 NO LONGER A QUALIFICATION FOR OP RATE WARNING
             OP RATE WARNING NOW PRINTS POINT ID, SCC, AND POLLUTANTS
             RECORDS WITH ZERO TOTAL EMISSIONS ARE DELETED
             # RECORDS READ IN AND # RECORDS DELETED ARE PRINTED IN RPT

*----------------------------------------------------------------------*

****************************
* MACRO DEFINITION ROUTINE *
****************************

*-----DEFINE SAS MACROS TO BE CALLED BY MAIN ROUTINE.
;
***** MACRO EMISIN

***** INPUT POINT SOURCE  FILE AND DIVIDE INTO INDUSTRY-SPECIFIC
      SUBFILES BASED ON SIC-SCC COMBINATIONS IN THE COF. ALSO DIVIDE
      INTO MAJOR-MINOR SOURCES BASED ON SPECIFIED EMISSION LIMITS IN
      THE CONTROL FILE.
;
%MACRO EMISIN;
%*;
%*---- INITIALIZE MACRO VARIABLES AND BUILD COMMAND LINE FOR DATA STEP
       FURTHER DETAIL CAN BE FOUND IN THE MACRO AREA.
;
%LET MAXFILE=%EVAL(&INDX2);
DATA MAJTEMP.DATA
%IF &MAXFILE>0 %THEN %DO I=1 %TO &MAXFILE;
   &&SUBDD&I...MAJOR
%END;
%IF &MINOR=Y %THEN %DO;
  MINMISC.DATA
  %IF &MAXFILE>0 %THEN %DO I=1 %TO &MAXFILE;
    &&SUBDD&I...MINOR
  %END;
%END;
 REPORT(KEEP=DEL_CNT REC_CNT);
 SET EMIS.DATA END=EOF;
    %GLOBAL REC_CNT DEL_CNT;
    KEEP STATE COUNTY SCC PLANT_ID POINT_ID AQCR SIC LAT LON
           UTM_ZONE UTMX UTMY WINTHRU SPRTHRU SUMTHRU
           FALTHRU HOURS DAYS WEEKS
           CONEFF1-CONEFF15 ESTMET1-ESTMET15 STACK_HT STACK_DI
           STACK_TP FLOW VELOCITY PLUME_HT
           NUMPOLL SAROAD1-SAROAD15 EMISS1-EMISS15;
*
*---- INITIALIZE REPORT POLLUTANTS AT ZERO;
*;
    SO2=0; SO4=0; NOX=0; CO=0; HCL=0; HF=0; NH3=0; TSP=0; VOC=0; THC=0;
    ARRAY SAROAD SAROAD1-SAROAD15;
    ARRAY EMISS EMISS1-EMISS15;
    ARRAY CONEFF CONEFF1-CONEFF15;
    ARRAY ESTMET ESTMET1-ESTMET15;
*;
*---- INITIALIZE RECORD COUNT
*;
```

```
 IF _N_=1 THEN REC_CNT=0;
 IF _N_=1 THEN DEL_CNT=0;
 REC_CNT+1;
 IF EOF THEN DO;
    CALL SYMPUT('REC_CNT',REC_CNT);
    CALL SYMPUT('DEL_CNT',DEL_CNT);
    OUTPUT REPORT;
 END;
*
*---- DELETE RECORDS WITH ZERO EMISSIONS
*;
      TOT_EMIS=0;
      DO OVER EMISS;
        TOT_EMIS=SUM(TOT_EMIS,EMISS);
      END;
      IF TOT_EMIS=0 THEN DO;
        DEL_CNT+1;
        CALL SYMPUT('DEL_CNT',DEL_CNT);
        DELETE;
      END;
 *
 *---- OUTPUT RECORD COUNT
 *;
*;
*     CHECK POINT SOURCE OPERATING DATA FOR VALIDITY
;
      IF DAYS=0 OR HOURS=0 THEN DO;
*
*---- ASSIGN MEANINGFUL VARIABLE NAMES TO POLLUTANTS FOR ERROR MESSAGE
*;
        DO _I_=1 TO NUMPOLL;
          IF SAROAD=42401 THEN SO2=ROUND(EMISS,1);
          ELSE IF SAROAD=12403 THEN SO4=ROUND(EMISS,1);
          ELSE IF SAROAD=42603 THEN NOX=ROUND(EMISS,1);
          ELSE IF SAROAD=42101 THEN CO=ROUND(EMISS,1);
          ELSE IF SAROAD=42302 THEN HCL=ROUND(EMISS,1);
          ELSE IF SAROAD=42303 THEN HF=ROUND(EMISS,1);
          ELSE IF SAROAD=42604 THEN NH3=ROUND(EMISS,1);
          ELSE IF SAROAD=11101 THEN TSP=ROUND(EMISS,1);
          ELSE IF SAROAD=43104 THEN VOC=ROUND(EMISS,1);
          ELSE IF SAROAD=43101 THEN THC=ROUND(EMISS,1);
        END;
        PUT  '### WARNING: POINT SOURCE OPERATING DATA INVALID FOR'
            '   STATE: ' STATE Z2. ' COUNTY: ' COUNTY Z4. ' PLANT: '
            PLANT_ID $4. ' POINT: ' POINT_ID $2. ' SCC: ' SCC 8./
        '             SO2: ' SO2 ' SO4: ' SO4 ' NOX: ' NOX ' CO: ' CO
        ' HCL: ' HCL ' HF: ' HF ' NH3: ' NH3 ' TSP: ' TSP ' VOC: ' VOC
        ' THC: ' THC /   '              OPERATING SCHEDULE DATA  '
          WEEKS= ' ' DAYS= ' ' HOURS= /;
        DAYS=.;
        HOURS=.;
        WEEKS=.;
      END;
*;
*     CHECK SCC CODE FOR 0, SKIP IF FOUND
;
      IF SCC=0 THEN DO;
        PUT '*** WARNING: SCC CODE OF 0 ENCOUNTERED FOR'/
            '             STATE: ' STATE Z2. ' COUNTY: ' COUNTY Z4.
            ' PLANT: ' PLANT_ID $4. ' POINT: ' POINT_ID $2.;
        RETURN;
      END;
*;
*---- LOOK FOR SIC-SCC MATCH.
;
      %IF &MAXFILE>0 %THEN %DO J=1 %TO &INDX2;
      IF SIC=&&SUBSIC&J AND SCC=&&SUBSCC&J THEN DO;
*;
*---- MATCH FOUND. CHECK FOR MAJOR POINT SOURCE.
;
      %IF &MINOR=Y %THEN %DO;
          %DO K=1 %TO &INDX3;
            DO _I_=1 TO NUMPOLL;
              IF &&LIM_ID&K=SAROAD THEN DO;
                IF EMISS>&&LIM_TH&K THEN DO;
                  MAJOR=1;
                  OUTPUT &&SUBDD&J...MAJOR /* MAJOR POINT SOURCE */;
                  RETURN;
                END;
              END;
            END;
          %END;
*;
*---- IF PROCESSING REACHES HERE, DETERMINE MINOR POINT SOURCE FILE
      NUMBER AND OUTPUT.
;
          MAJOR=0;
          OUTPUT &&SUBDD&J...MINOR /* MINOR POINT SOURCE */;
          RETURN;
      %END;
%*;
%*---- PROCESS FOLLOWING IF MINOR=N;
%*;
    %ELSE %DO;
      MAJOR=1;
      OUTPUT &&SUBDD&J...MAJOR /* MAJOR POINT SOURCE */;
      RETURN;
    %END;
    END;
  %END;
*;
*---- IF PROCESSING REACHES HERE, CHECK FOR MISC. MAJOR POINT SOURCE
;
  %IF &MINOR=Y %THEN %DO;
      %DO K=1 %TO &INDX3;
        DO _I_=1 TO NUMPOLL;
          IF &&LIM_ID&K=SAROAD THEN DO;
            IF EMISS>&&LIM_TH&K THEN DO;
              MAJOR=1;
              OUTPUT MAJTEMP.DATA /* MISC. MAJOR POINT SOURCE */;
              RETURN;
            END;
          END;
        END;
      %END;
*;
*---- IF PROCESSING REACHES HERE, WE HAVE A MISC. MINOR POINT SOURCE
;
```

```
      MAJOR=0;
      OUTPUT MINTEMP.DATA /* MISCELLANEOUS MINOR POINT SOURCE */;
      RETURN;
  %END;
  %ELSE %DO;
      MAJOR=1;
      OUTPUT MAJTEMP.DATA /* MISC MAJOR POINT SOURCE */;
      RETURN;
  %END;
CALL SYMPUT('MAJOR',MAJOR);
*;
%MEND EMISIN;
*;
***** MACRO DETAIL

***** PRINT OUT EMISSION SUBFILES. INVOKED BY SPECIFYING "D" IN
      THE RUN IDENTIFICATION RECORD OF THE CONTROL OPTIONS FILE.
      MACRO BUILDS FILENAMES USING PASSED ARGUMENTS THEN CALLS THE
      SAS PROC PRINT.
;
%MACRO DETAIL;
%*;
  %IF &DETAIL=D %THEN %DO;
%*;
%*---- POINT SOURCE RUN
;
      PROC PRINT DATA=MAJMISC.DATA (OBS=50);
      TITLE 'EMISSION SUBFILE-MISCELLANEOUS MAJOR POINT SOURCES';
      %IF &MINOR=Y %THEN %DO;
        PROC PRINT DATA=MINMISC.DATA (OBS=50);
        TITLE 'EMISSION SUBFILE-MISCELLANEOUS MINOR POINT SOURCES';
      %END;
      %IF &INDX2>0 %THEN %DO X=1 %TO &INDX2;
        PROC PRINT DATA=&&SUBDD&X...MAJOR (OBS=50);
        TITLE "EMISSION SUBFILE-&&SUBDD&X MAJOR POINT SOURCES";
        %IF MINOR=Y %THEN %DO;
          PROC PRINT DATA=&&SUBDD&X...MINOR (OBS=50);
          TITLE "EMISSION SUBFILE-&&SUBDD&X MINOR POINT SOURCES";
        %END;
      %END;
  %END;
%MEND DETAIL;
*
;
***** MACRO SORTEM

***** SORT EMISSION SUBFILES
;
%MACRO SORTEM;
%*;
%*---- SORT MISCELLANEOUS FILES
;
  %LET FILENUM=%EVAL(&INDX2);
    %LET ORDER=%STR(SCC STATE COUNTY PLANT_ID POINT_ID);
    PROC SORT DATA=MAJTEMP.DATA OUT=MAJMISC.DATA;
    BY &ORDER;
    %IF &MINOR=Y %THEN %DO;
      PROC SORT DATA=MINTEMP.DATA OUT=MINMISC.DATA;
      BY &ORDER;
    %END;
%*;
%*---- SORT SUBFILES IF PRESENT
;
  %IF &FILENUM>0 %THEN %DO X-1 %TO &FILENUM;
    PROC SORT DATA-&&SUBDD&X...&MAJOR;
    BY &ORDER;
    %IF &MINOR-Y %THEN %DO;
      PROC SORT DATA-&&SUBDD&X...MINOR;
      BY &ORDER;
    %END;
  %END;
%*;
%MEND SORTEM;
*
;
***** MACRO SETUP

***** CREATE MACRO VARIABLES FOR SUBFILE ALLOCATION
      AND CALL THE INPUT ROUTINE.
;
%MACRO SETUP;
  %GLOBAL SUBDD1 SUBDD2 SUBDD3 SUBDD4 SUBDD5 SUBDD6 SUBDD7 SUBDD8
    SUBDD9 SUBDD10 SUBDD11 SUBDD12 SUBDD13 SUBDD14 SUBDD15 SUBDD16
    SUBDD17 SUBDD18 SUBDD19 SUBDD20 SUBDD21 SUBDD22 SUBDD23 SUBDD24
    SUBDD25 SUBDD26 SUBDD27 SUBDD28 SUBDD29 SUBDD30 SUBDD31 SUBDD32
    SUBDD33 SUBDD34 SUBDD35 SUBDD36 SUBDD37 SUBDD38 SUBDD39 SUBDD40
    SUBDD41 SUBDD42 SUBDD43 SUBDD44 SUBDD45 SUBDD46 SUBDD47 SUBDD48
    SUBDD49 SUBDD50;
  %IF &INDX2>0 %THEN %DO;
%*;
%*---- CREATE MACRO VARIABLES FROM CONTROL FILE VARIABLES.
;
    DATA _NULL_;SET ONE;
    %DO AB-1 %TO &INDX2;
      CALL SYMPUT("SUBSIC&AB",SUBSIC&AB);
      CALL SYMPUT("SUBSCC&AB",SUBSCC&AB);
      CALL SYMPUT("SUBDD&AB",SUBDD&AB);
    %END;
      %DO BA-1 %TO &INDX3;
        CALL SYMPUT("LIM_ID&BA",LIM_ID&BA);
        CALL SYMPUT("LIM_TH&BA",LIM_TH&BA);
      %END;
  RUN;
  %END;
%*;
%*---- CALL THE INPUT MACRO.
;
  %EMISIN
%*;
%*---- SORT EMISSION SUBFILES.
;
  %SORTEM
%*;
%MEND SETUP;
*
;
*****************************
* END OF MACRO DEFINITIONS *
```

```
****************************
*
;
**********************
* MAIN PROGRAM: MDEM *
**********************

***** THIS PROGRAM WILL:
                  1. READ THE CONTROL OPTIONS FILE.
                  2. READ THE APPROPRIATE EMISSIONS FILE.
                  3. SORT EMISSION SUBFILES.
                  4. PRODUCE A DIAGNOSTIC REPORT.
;
***** READ THE CONTROL FILE AND CALL THE INPUT MACRO.
;
*;
*---- OPEN FILES, INITIALIZE VARIABLES AND DEFINE ARRAYS.
;
DATA ONE(DROP=TYPE); INFILE COF EOF=WRITE;
  ARRAY SUBSIC(INDX2) SUBSIC1-SUBSIC50;
  ARRAY SUBSCC(INDX2) SUBSCC1-SUBSCC50;
  ARRAY SUBDD(INDX2) $ 8 SUBDD1-SUBDD50;
  ARRAY LIM_ID(INDX3) LIM_ID1-LIM_ID15;
  ARRAY LIM_TH(INDX3) LIM_TH1-LIM_TH15;
  RETAIN SOURCE DETAIL RUN_ID SUBSIC1-SUBSIC50 SUBSCC1-SUBSCC50
       SUBDD1-SUBDD50 LIM_ID1-LIM_ID15 LIM_TH1-LIM_TH15 MINOR;
  INPUT @1 TYPE 1. @;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION).
;
  IF TYPE=1 THEN DO;
*;
*     CHECK FOR TOO MANY TYPE 1 RECORDS.
;
    INDX1+1;
    IF INDX1>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN CONTROL FILE';
      ABORT;
    END;
    INPUT @3 SOURCE $2. @6 DETAIL $1. @8 MINOR $1. @10  RUN_ID $62.;
    CALL SYMPUT('DETAIL',DETAIL);
    CALL SYMPUT('MINOR',MINOR);
    CALL SYMPUT('SOURCE',SOURCE);
*;
*     CHECK DATA FOR VALIDITY.
;
    IF SOURCE NE 'PS' THEN DO;
      PUT '*** FATAL: INVALID EMISSIONS FILE TYPE ' SOURCE=;
      ABORT;
    END;
    IF DETAIL NE 'D' AND DETAIL NE 'S' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT' DETAIL=;
      ABORT;
    END;
    RETURN;
  END;
*;
*---- TYPE 2 CONTROL RECORD (SIC-SCC DEFINITION).
;
```

```
  IF TYPE=2 THEN DO;
*;
*     INCREMENT RECORD COUNTER AND ARRAY INDEX.
;
    INDX2+1;
*;
*     CHECK FOR TOO MANY SIC-SCC COMBINATIONS.
;
    IF(SOURCE='PS' AND INDX2>24)
      THEN DO;
      PUT '*** FATAL: TOO MANY SIC-SCC COMBINATIONS SPECIFIED ';
      ABORT;
    END;
*;
*     INPUT DATA.
;
    INPUT @3 SUBSIC 4. @8 SUBSCC 8. @17 SUBDD $8.;
    RETURN;
  END;
*;
*---- TYPE 3 CONTROL RECORD (MAJOR-MINOR DEFINITION).
;
  IF TYPE=3 THEN DO;
*;
*     INCREMENT COUNTER AND ARRAY INDEX.
;
    INDX3+1;
*;
*     CHECK FOR TOO MANY EMISSION LIMITS.
;
    IF INDX3>15 THEN DO;
      PUT '*** FATAL: TOO MANY MAJOR-MINOR EMISSION LIMITS ';
      ABORT;
    END;
*;
*     INPUT DATA.
;
    INPUT @3 LIM_ID 5. @9 LIM_TH 7. @17 SUBDD;
    RETURN;
  END;
*;
*---- INVALID CONTROL RECORD.
;
  IF TYPE<1 OR TYPE>3 THEN DO;
  PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
  ABORT;
  END;
*;
WRITE: IF INDX2=. THEN INDX2=0;
       IF INDX3=. THEN INDX3=0;
       OUTPUT;
*;
*
***** CALL PROPER ROUTINE TO CREATE SIC-SCC SUBFILES
;
CALL SYMPUT('INDX2',INDX2);
CALL SYMPUT('INDX3',INDX3);
CALL SYMPUT('MINOR',MINOR);
RUN;
```

```
%SETUP
*
***** WRITE DIAGNOSTIC REPORT
;
*---- DEFINE FILE, ASSIGN ARRAYS AND INITIALIZE VARIABLES
;
DATA _NULL_;MERGE ONE REPORT;
  ARRAY SUBSIC SUBSIC1-SUBSIC50;
  ARRAY SUBSCC SUBSCC1-SUBSCC50;
  ARRAY SUBDD SUBDD1-SUBDD50;
  ARRAY LIM_ID LIM_ID1-LIM_ID15;
  ARRAY LIM_TH LIM_TH1-LIM_TH15;
  FILE PRINT NOTITLES;
  IF DETAIL='S' THEN REPO=' SUMMARY';ELSE REPO='DETAILED';
  DT=DATE();TM=TIME();
  RUNCOL=66-LENGTH(RUN_ID)/2;
  Y=1;Z=8;
*
*---- PRINT HEADER
;
  PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
      @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
      @97 'MODEL DATA EXTRACTION MODULE (MDEM)'//
      @2 'DIAGNOSTIC REPORT'
      @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
      'CONTROL FILE LISTING' @77 55*'-'//;
*
*---- PRINT TYPE 1 COF RECORD
;
  PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SOURCE: ' SOURCE ' DETAIL: '
      DETAIL ' MINOR FLAG: ' MINOR ' RUN ID: ' RUN_ID//;
*
*---- PRINT TYPE 2 COF RECORDS
;
  IF INDX2>0 THEN DO;
    PUT @2 'SIC/SCC DEFINITION RECORDS. COUNT=' INDX2 2./;
    DO J=1 TO (INT(INDX2/8)+1);
      PUT @2 'SIC CODE :' @16 @;
      DO _I_=Y TO Z;
        PUT SUBSIC 4. +3 ':' +3 @;
      END;
      PUT /@2 99*'-'/@2 'SCC CODE :' @14 @;
      DO _I_=Y TO Z;
        PUT SUBSCC 8. +1 ':' +1 @;
      END;
      PUT /@2 99*'-'/@2 'DD LABEL :' @14 @;
      DO _I_=Y TO Z;
        PUT SUBDD $8. +1 ':' +1 @;
      END;
      Y=Y+8;Z=Z+8;
      PUT //;
    END;
  END;
*
*---- PRINT TYPE 3 COF RECORDS
;
  Y=1;Z=8;
  IF INDX3>0 THEN DO;
    PUT @2 'MAJOR/MINOR SOURCE DEFINITION RECORD. COUNT=' INDX3 2.//;
    DO J=1 TO (INT(INDX3/8)+1);
      PUT @2 'SAROAD CODE :' @17 @;
      DO _I_=Y TO Z;
        PUT LIM_ID 5. +2 ':' +2 @;
      END;
      PUT /@2 92*'-'/@2 'EMISSIONS :' @16 @;
      DO _I_=Y TO Z;
        PUT LIM_TH Z7. +1 ':' +1 @;
      END;
      Y=Y+8;Z=Z+8;
      PUT //;
    END;
  END;
*
;
  DEL_CNT=&DEL_CNT; REC_CNT=&REC_CNT;
  PUT /@2 54*'-' @58 'EMISSIONS FILE SUMMARY ' 53*'-'//
      @39 'TOTAL ZERO EMISSION POINT SOURCE RECORDS DELETED'/
      @38 55*'-'//@38 DEL_CNT 6. //
      @39 'TOTAL POINT SOURCE RECORDS READ INTO EMISSIONS FILE'/
      @38 55*'-'//@38 REC_CNT 6. _PAGE_;
*
*---- END OF SUMMARY REPORT. CALL MACRO FOR DETAILED REPORT.
;
CALL SYMPUT('INDX2',INDX2);
RUN;
%DETAIL
*
;
*****************************
* END OF MDEM MAIN PROGRAM *
*****************************
;
```

```
*OPTIONS DQUOTE NOSOURCE;
*-----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: MODEL DATA EXTRACTION MODULE (MDEM) - AREA SOURCES

  LANGUAGE: SAS(VERSION 5.16)

  PURPOSE: TO EXTRACT DATA FROM A PREPROCESSED SAS FORMATTED
           AREA SOURCE EMISSIONS FILE, ORIGINATING FROM THE
           EMISSIONS INVENTORY SYSTEM (EIS) MASTER FILE.
           MDEM WILL:

                1. DROP UNNECESSARY EIS DATA.
                2. CREATE INDUSTRY-SPECIFIC EMISSION SUBFILES BASED
                   ON SCC COMBINATIONS.
                3. PROVIDE A REPORT ON PROCESSING ACTIVITIES.

  VARIABLE LIST:  CONTROL OPTIONS FILE

NAME         ROUTINE               DESCRIPTION
================================================================
ANN           MAIN        NUMBER OF ANNUAL POLLUTANTS TO EXTRACT
DETAIL        MAIN        LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
INDX1         MAIN        NUMBER OF TYPE 1 RECORDS (RUN IDENT.)
INDX2         MAIN        NUMBER OF TYPE 2 RECORDS (SCC)
NAME1-15      MAIN        VARIABLE NAMES FOR ANNUAL POLLUTANTS
RUN_ID        MAIN        RUN IDENTIFICATION HEADER
SAROAD1-15    MAIN        SAROAD CODE FOR ANNUAL POLLUTANTS
SUBSCC1-50    MAIN        SCC CODES FOR INDUSTRY SUBFILES
SUBDD1-50     MAIN        JCL LABELS FOR SCC SUBFILES
SOURCE        MAIN        EMISSIONS FILE TYPE
TYPE          MAIN        CONTROL OPTION RECORD TYPE

  VARIABLE LIST:  EMISSIONS FILES

NAME         ROUTINE               DESCRIPTION
================================================================
AQCR          EMISIN     AQCR
COUNTY        EMISIN     COUNTY CODE
SCC           EMISIN     SCC CODE
SOURCE        EMISIN     SOURCE RECORD FLAG
STATE         EMISIN     STATE CODE
NUMPOLL       EMISIN      NUMBER OF POLLUTANTS ON EMISSIONS RECORD
EMISS1-15     EMISIN      EMISSIONS FOR POLLUTANTS (TONS/YR)
SAROAD1-15    EMISIN      POLLUTANT CODES (UP TO 15 POLLUTANTS)

  VARIABLE LIST:  GENERAL

NAME         ROUTINE               DESCRIPTION
================================================================
AB            SETUP       COUNTER FOR SCC MACRO VARIABLES
B             EMISIN      STRING VARIABLE FOR JCL DD LABEL ( N.A OR P)
BA            SETUP       COUNTER FOR LIMIT MACRO VARIABLES
DEL_CNT       EMISIN      DELETED ZERO EMISSIONS COUNTER
DT            MAIN        DATE OF DIAGNOSTIC REPORT
I             EMISIN      INDEX FOR SUBFILE CREATION
J             EMISIN      LOOP COUNTER
```

```
SUBSCC          SETUP        SCC CODES FOR INDUSTRY SUBFILES
MAXFILE         EMISIN       NUMBER OF INDUSTRY SUBFILES
ORDER           SORTEM       SORT ORDER OF SUBFILES
Q               EMISIN       MACRO COUNTER
REC_CNT         EMISIN       EMISSIONS INPUT RECORD COUNTER
RUNCOL          MAIN         COLUMN TO CENTER RUN_ID IN DIAGNOSTIC REPORT
THC_DEL         MAIN         ZERO EMISSIONS DELETED COUNTER FOR THC SPLIT
TSP_DEL         MAIN         ZERO EMISSIONS DELETED COUNTER FOR TSP SPLIT
TYPE            EMISIN       EMISSIONS RECORD TYPE
TM              MAIN         TIME OF DIAGNOSTIC REPORT
X            SORTEM,DETAIL   FILE COUNTER AND LOOP INDEX
Y               MAIN         START INDEX OF COF VARIABLES IN REPORT
Z               MAIN         END INDEX OF COF VARIABLES IN REPORT

  ERROR HANDLING:
     INPUT DATA FROM THE CONTROL OPTION FILE IS CHECKED FOR VALIDITY.
     THE DATA FROM THE PREPROCESSED SAS FILE HAS ALREADY BEEN CHECKED BY
     THE EIS SYSTEM.  TWO LEVELS OF ERRORS ARE SUPPORTED:

                             1. FATAL: EXECUTION OF MDEM IS TERMINATED.
                             2. WARNING: USER IS NOTIFIED OF OCCURRENCE BUT
                                PROGRAM CONTINUES EXECUTION.

  CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

  METHOD: MDEM READS THE CONTROL FILE, CREATES SAS MACRO VARIABLES
          FROM THE CONTROL DATA AND CALLS THE PROPER  INPUT ROUTINE
          TO CREATE THE EMISSION SUBFILES AND PRODUCE A DIAGNOSTIC
          REPORT.  EMISSION RATES ARE ORGANIZED INTO VARIABLES DEFINED
          IN THE CONTROL FILE.

  PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, JUNE 1985

    MODIFIED: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, JUNE 1986
    MODIFIED: LYSA LEBOWITZ, ALLIANCE TECHNOLOGIES CORPORATION
              SEPTEMBER 1987
    MODIFIED: DANIEL DULLEBA, ALLIAMCE TECHNOLOGIES CORP., JANUARY 1988
              DELETES RECORDS WITH ZERO TOTAL EMISSIONS IN MAIN FILE
              SPLITS MAIN FILE INTO THC/NOX AND TSP/SO2 FILES
              DELETES RECORDS WITH ZERO TOTAL EMISSIONS IN SPLIT FILES
              COUNTS RECORDS READ IN AND DELETED/PRINTED IN RPT


*-----------------------------------------------------------------------*

****************************
* MACRO DEFINITION ROUTINE *
****************************

*-----DEFINE SAS MACROS TO BE CALLED BY MAIN ROUTINE.
;
***** MACRO EMISIN

***** INPUT AREA SOURCE EMISSIONS FILE AND DIVIDE INTO SCC SPECIFIC
      SUBFILES USING CONTROL FILE DATA.
;
%MACRO EMISIN;
%*;
%*---- INITIALIZE MACRO VARS AND BUILD COMMAND LINE FOR DATA STATEMENT
```

```
       THE COMMAND LINE IS FORMED BY CONCATENATING THE MISC. FILE
       NAME TO ANY SUBFILES SPECIFIED IN THE COF PLUS THE
       REPORT FILE.  EXTRACT ANNUAL POLLUTANTS.
;
%LET MAXFILE=%EVAL(&INDX2);
DATA TEMP.DATA
%IF &MAXFILE>0 %THEN %DO I=1 %TO &MAXFILE;
  &&SUBDD&I...AREA
%END;
REPORT(KEEP=DEL_CNT REC_CNT);
  SET EMIS.DATA END=EOF;
    %GLOBAL REC_CNT DEL_CNT ;
    ARRAY SAROAD SAROAD1-SAROAD15;
    ARRAY EMISS EMISS1-EMISS15;
    KEEP SCC STATE COUNTY &VARLIST;
    FORMAT &VARLIST COMMA9.0;
*
*---- INITIALIZE RECORD COUNT
*;
    IF _N_=1 THEN DEL_CNT=0;
    IF _N_=1 THEN REC_CNT=0;
    REC_CNT+1;
*
*---- DELETE RECORDS WITH ZERO EMISSIONS
*;
    TOT_EMIS=0;
    DO OVER EMISS;
      TOT_EMIS=SUM(TOT_EMIS,EMISS);
    END;
    IF TOT_EMIS=0 THEN DO;
      DEL_CNT+1;
      DELETE;
    END;
*
*---- OUTPUT RECORD COUNT
*;
*   IF EOF THEN DO;
      CALL SYMPUT('DEL_CNT',DEL_CNT);
      CALL SYMPUT('REC_CNT',REC_CNT);
*     OUTPUT REPORT;
*   END;
*
*     EXTRACT EIS POLLUTANTS;
*;
            DO _I_=1 TO NUMPOLL;
              SELECT (SAROAD);
              %DO Q=1 %TO &ANN;
                WHEN (&&SAROAD&Q) &&NAME&Q=EMISS;
              %END;
                OTHERWISE;
              END;
            END;
*;
*;
*---- LOOK FOR SCC MATCH. OUTPUT TO PROPER FILE (FILENUM).
;
      %IF &MAXFILE>0 %THEN %DO J=1 %TO &INDX2;
        IF SCC=&&SUBSCC&J THEN DO;
          OUTPUT &&SUBDD&J...AREA /* AREA SOURCE SUBFILE */;
          RETURN;
        END;
      %END;
*;
*---- IF PROCESSING REACHES HERE THEN NO MATCH WAS FOUND.
      OUTPUT TO MISCELLANEOUS FILE.
;
      OUTPUT TEMP.DATA /* AREA SOURCE MISCELLANEOUS FILE */;
      RETURN;
%MEND EMISIN;
*;
*
;
***** MACRO DETAIL

***** PRINT OUT EMISSION SUBFILES. INVOKED BY SPECIFYING "D" IN
      THE RUN IDENTIFICATION RECORD OF THE CONTROL OPTIONS FILE.
      MACRO BUILDS FILENAMES USING PASSED ARGUMENTS THEN CALLS THE
      SAS PROC PRINT.
;
%MACRO DETAIL;
%*;
%*---- CALCULATE POLLUTANT SUMS;
%*;
  %IF &DETAIL=T %THEN %DO;
    PROC MEANS DATA=MAJMISC.DATA MAXDEC=0 SUM;
    VAR &VARLIST;
    TITLE 'ANNUAL TOTALS FOR MDEM EMISSIONS FILE';
  %END;
  %IF &DETAIL=D %THEN %DO;
%*;
%*---- AREA SOURCE RUN
;
      PROC PRINT DATA=MAJMISC.DATA(OBS=50);
      TITLE 'EMISSION SUBFILE-AREA SOURCES';
      ID SCC STATE COUNTY;
      FORMAT STATE Z2. COUNTY Z4.;
      %IF &INDX2>0 %THEN %DO X=1 %TO &INDX2;
        PROC PRINT DATA=&&SUBDD&X...AREA(OBS=50);
        TITLE "EMISSION SUBFILE-&&SUBDD&X AREA SOURCES";
        ID SCC STATE COUNTY;
        FORMAT STATE Z2. COUNTY Z4.;
      %END;
    %END;
%MEND DETAIL;
*
;
***** MACRO SORTEM

***** SORT EMISSION SUBFILES
;
%MACRO SORTEM;
%*;
%*---- SORT MISCELLANEOUS FILES
;
  %LET FILENUM=%EVAL(&INDX2);
    %LET ORDER=%STR(SCC STATE COUNTY);
    PROC SORT DATA=TEMP.DATA OUT=MAJMISC.DATA;
    BY &ORDER;
  %LET MEM=%STR(AREA);
%*;
%*---- SORT SUBFILES IF PRESENT
;
 %IF &FILENUM>0 %THEN %DO X=1 %TO &FILENUM;
  PROC SORT DATA=&&SUBDD&X...&MEM;
  BY &ORDER;
 %END;
%*;
%MEND SORTEM;
*
;
***** MACRO SETUP

***** CREATE MACRO VARIABLES FOR SUBFILE ALLOCATION
   AND CALL THE  INPUT ROUTINE.
;
%MACRO SETUP;
 %GLOBAL SUBDD1 SUBDD2 SUBDD3 SUBDD4 SUBDD5 SUBDD6 SUBDD7 SUBDD8
  SUBDD9 SUBDD10 SUBDD11 SUBDD12 SUBDD13 SUBDD14 SUBDD15 SUBDD16
  SUBDD17 SUBDD18 SUBDD19 SUBDD20 SUBDD21 SUBDD22 SUBDD23 SUBDD24
  SUBDD25 SUBDD26 SUBDD27 SUBDD28 SUBDD29 SUBDD30 SUBDD31 SUBDD32
  SUBDD33 SUBDD34 SUBDD35 SUBDD36 SUBDD37 SUBDD38 SUBDD39 SUBDD40
  SUBDD41 SUBDD42 SUBDD43 SUBDD44 SUBDD45 SUBDD46 SUBDD47 SUBDD48
  SUBDD49 SUBDD50 VARLIST;
%*;
%*---- CREATE MACRO VARIABLES FROM CONTROL FILE VARIABLES.
;
 DATA _NULL_;SET ONE;
 %IF &INDX2>0 %THEN %DO;
  %DO AB=1 %TO &INDX2;
   CALL SYMPUT("SUBSCC&AB",SUBSCC&AB);
   CALL SYMPUT("SUBDD&AB",SUBDD&AB);
  %END;
 %END;
%*;
%*---- CREATE ANNUAL POLLUTANT VARIABLE NAMES;
%*;
  %DO BA=1 %TO &ANN;
   CALL SYMPUT("SAROAD&BA",SAROAD&BA);
   CALL SYMPUT("NAME&BA",NAME&BA);
 %END;
 RUN;
  %DO BA=1 %TO &ANN;
   %LET VARLIST=&VARLIST&&NAME&BA;
  %END;
%*;
%*---- CALL THE INPUT MACRO.
;
  %EMISIN
%*;
%*---- SORT EMISSION SUBFILES.
;
 %SORTEM
%*;
%MEND SETUP;
*
;
****************************
```

```
* END OF MACRO DEFINITIONS *
*****************************
*
;
**********************
* MAIN PROGRAM: MDEM *
**********************

***** THIS PROGRAM WILL:
                1. READ THE CONTROL OPTIONS FILE.
                2. READ THE APPROPRIATE EMISSIONS FILE.
                3. ASSIGN EMISSIONS TO USER-DEFINED VARIABLES.
                4. SORT EMISSION SUBFILES.
                5. PRODUCE A DIAGNOSTIC REPORT.
;
***** READ THE CONTROL FILE AND CALL THE  INPUT MACRO.
;
*;
*---- OPEN FILES, INITIALIZE VARIABLES AND DEFINE ARRAYS.
;
DATA ONE(DROP=TYPE); INFILE COF EOF=WRITE;
  ARRAY SAROAD SAROAD1-SAROAD15;
  ARRAY NAME $ 8 NAME1-NAME15;
  ARRAY SUBSCC(INDX2) SUBSCC1-SUBSCC50;
  ARRAY SUBDD(INDX2) $ 8 SUBDD1-SUBDD50;
  RETAIN SOURCE DETAIL RUN_ID SUBSCC1-SUBSCC50 SUBDD1-SUBDD50
         NAME1-NAME15 ANN SAROAD1-SAROAD15;
  INPUT @1 TYPE 1. @;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION).
;
  IF TYPE=1 THEN DO;
*;
*     CHECK FOR TOO MANY TYPE 1 RECORDS.
;
    INDX1+1;
    IF INDX1>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN CONTROL FILE';
      ABORT;
    END;
    INPUT @3 SOURCE $2. @6 DETAIL $1. @8 MINOR $1. @10  RUN_ID $62.;
    CALL SYMPUT('DETAIL',DETAIL);
    CALL SYMPUT('SOURCE',SOURCE);
*;
*     CHECK DATA FOR VALIDITY.
;
    IF SOURCE NE 'AS' THEN DO;
      PUT '*** FATAL: INVALID FILE TYPE ' SOURCE=;
      ABORT;
    END;
    IF DETAIL NE 'D' AND DETAIL NE 'S' AND DETAIL NE 'T' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT' DETAIL=;
      ABORT;
    END;
    RETURN;
  END;
*;
*---- TYPE 2 CONTROL RECORD (SCC DEFINITION).
;
```

```
  IF TYPE=2 THEN DO;
*;
*     INCREMENT RECORD COUNTER AND ARRAY INDEX.
;
    INDX2+1;
*;
*     CHECK FOR TOO MANY SCC COMBINATIONS.
;
     IF SOURCE ='AS' AND INDX2>49
      THEN DO;
      PUT '*** FATAL: TOO MANY SCC COMBINATIONS SPECIFIED ';
      ABORT;
    END;
*;
*     INPUT DATA.
;
    INPUT @8 SUBSCC 8. @17 SUBDD $8.;
    RETURN;
  END;
*;
;
*---- TYPE 3 CONTROL RECORD (ANNUAL POLLUTANTS);
*;
  IF TYPE=3 THEN DO;
*;
*     INPUT NUMBER OF ANNUAL POLLUTANTS;
*;
    INPUT @3 ANN 2.;
*;
*    MAKE SURE CORRECT NUMBER OF POLLUTANTS;
*;
    IF ANN LT 1 OR ANN GT 15 THEN DO;
      PUT '*** FATAL: INCORRECT NUMBER OF ANNUAL POLLUTANTS';
      ABORT;
    END;
*;
*---- INPUT ANNUAL POLLUTANT IDENTIFICATION RECORDS;
*;
    DO _I_=1 TO ANN;
      INPUT @1 TYPE 1. @;
*;
*     CHECK RECORD;
*;
       IF TYPE NE . THEN DO;
         PUT '***FATAL: INVALID ANNUAL POLLUTANT IDENTIFICATION RECORD';
         ABORT;
       END;
*;
*      INPUT RECORD;
*;
       INPUT @2 SAROAD 5. @8 NAME $8.;
      END;
      RETURN;
    END;
*;
*---- INVALID CONTROL RECORD.
;
  IF TYPE<1 OR TYPE>3 THEN DO;
    PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
    ABORT;
  END;
*;
WRITE: IF INDX2-. THEN INDX2-0;
       IF INDX3-. THEN INDX3-0;
       OUTPUT;
*;
*
***** CALL PROPER ROUTINE TO CREATE SCC SUBFILES
;
CALL SYMPUT('SOURCE',SOURCE);
CALL SYMPUT('INDX2',INDX2);
CALL SYMPUT('INDX3',INDX3);
CALL SYMPUT('MINOR',MINOR);
CALL SYMPUT('ANN',ANN);
RUN;
%SETUP
*
*---- SEPARATE FILE INTO SEPARATE COMPONENTS FOR NON-ZERO RECORDS
*;
DATA MAJMISC1.DATA
    (DROP-ASO2 ASO4 ATSP ACO AHCL AHF ANH3 THC_DEL TSP_DEL)
     MAJMISC2.DATA(DROP-ANOX AVOC ATHC THC_DEL TSP_DEL)
     TWO(KEEP-THC_DEL TSP_DEL);
     SET MAJMISC.DATA END-EOF;
     %GLOBAL THC_DEL TSP_DEL;
     IF _N_ - 1 THEN THC_DEL-0;
     IF _N_ - 1 THEN TSP_DEL-0;
     IF ASO2 > 0 OR ASO4 > 0 OR ATSP > 0 OR ACO > 0 OR AHCL > 0
     OR AHF > 0 OR ANH3 > 0 THEN OUTPUT MAJMISC2.DATA;
     ELSE TSP_DEL+1;
     IF ANOX > 0 OR AVOC > 0 OR ATHC > 0 THEN OUTPUT MAJMISC1.DATA;
     ELSE THC_DEL+1;
     IF EOF THEN DO;
       CALL SYMPUT('THC_DEL',THC_DEL);
       CALL SYMPUT('TSP_DEL',TSP_DEL);
       OUTPUT TWO;
     END;
*
***** WRITE DIAGNOSTIC REPORT
;
*---- DEFINE FILE, ASSIGN ARRAYS AND INITIALIZE VARIABLES
;
DATA _NULL_;MERGE ONE TWO REPORT;
  ARRAY SUBSCC SUBSCC1-SUBSCC50;
  ARRAY NAME $ 8 NAME1-NAME15;
  ARRAY SAROAD SAROAD1-SAROAD15;
  ARRAY SUBDD SUBDD1-SUBDD50;
  FILE PRINT NOTITLES;
  IF DETAIL-'S' OR DETAIL-'T' THEN REPO-' SUMMARY';ELSE REPO-'DETAILED';
  DT-DATE();TM-TIME();
  RUNCOL-66-LENGTH(RUN_ID)/2;
  Y-1;Z-8;
*
*---- PRINT HEADER
;
  PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
      @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
      @97 'MODEL DATA EXTRACTION MODULE (MDEM)'//
      @2 'DIAGNOSTIC REPORT'
      @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
      'CONTROL FILE LISTING' @77 55*'-'//;
*
*---- PRINT TYPE 1 COF RECORD
;
  PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SOURCE: ' SOURCE ' DETAIL: '
      DETAIL ' MINOR FLAG: ' MINOR ' RUN ID: ' RUN_ID//;
*
*---- PRINT TYPE 2 COF RECORDS
;
  IF INDX2>0 THEN DO;
    PUT @2 'SCC DEFINITION RECORDS. COUNT=' INDX2 2./;
    DO J=1 TO (INT(INDX2/8)+1);
      PUT /@2 99*'-'/@2 'SCC CODE :' @14 @;
      DO _I_=Y TO Z;
        PUT SUBSCC 8. +1 ':' +1 @;
      END;
      PUT /@2 99*'-'/@2 'DD LABEL :' @14 @;
      DO _I_=Y TO Z;
        PUT SUBDD $8. +1 ':' +1 @;
      END;
      Y=Y+8;Z=Z+8;
      PUT //;
    END;
  END;
*
*---- PRINT TYPE 3 COF RECORDS;
*;
  PUT @2 'POLLUTANT IDENTIFICATION RECORDS: ' ANN 2.//;
  PUT @57 'SAROAD    POLLUTANT';
  PUT @56 '--------------------';
  DO _I_=1 TO ANN;
    PUT @57 SAROAD 5. @68 NAME $8.;
  END;
  DEL_CNT=&DEL_CNT; REC_CNT=&REC_CNT; THC_DEL=&THC_DEL;TSP_DEL=&TSP_DEL;
  PUT //;
        PUT /@2 53*'-' @58 'EMISSIONS FILE SUMMARY ' 52*'-'//
        @39 'TOTAL ZERO EMISSION AREA SOURCE RECORDS DELETED'/
        @38 55*'-' // @39 DEL_CNT 6. //
        @39 'ADDITIONAL ZERO EMISSION AREA SOURCE THC RECORDS DELETED'/
        @38 55*'-' // @39 THC_DEL 6. //
        @39 'ADDITIONAL ZERO EMISSION AREA SOURCE TSP RECORDS DELETED'/
        @38 55*'-' // @39 TSP_DEL 6. //
        @39 'TOTAL AREA SOURCE RECORDS READ INTO EMISSIONS FILE'/
        @38 55*'-' // @39 REC_CNT 6. _PAGE_;
*
*---- END OF SUMMARY REPORT. CALL MACRO FOR DETAILED REPORT.
;
CALL SYMPUT('INDX2',INDX2);
CALL SYMPUT('MINOR',MINOR);
RUN;
%DETAIL
*
;
****************************
* END OF MDEM MAIN PROGRAM *
****************************
;
```

APPENDIX D

TEMPORAL ALLOCATION MODULE

```
OPTIONS DQUOTE MPRINT;
*----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: TEMPORAL ALLOCATION MODULE (TAM) - POINT SOURCES

  LANGUAGE: SAS (VERSION 5.08)

  PURPOSE: TO APPLY TEMPORAL ALLOCATION FACTORS AND TIMEZONE DATA
           TO EMISSION RECORDS OUTPUT FROM MDEM.

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME          ROUTINE                   DESCRIPTION
======================================================================

TYPE            MAIN        CONTROL OPTIONS RECORD TYPE
SCE             MAIN        SOURCE TYPE OF EMISSION FILE
DETAIL          MAIN        LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
SASMEM          MAIN        SAS MEMBER NAME OF INPUT EMISSION FILE
TAFDAY          MAIN        NUMBER OF TAFDAY IN TEMPORAL ALLOCATION FILE
RUN_ID          MAIN        RUN IDENTIFICATION HEADER

  VARIABLE LIST: TIMEZONE FILE

NAME          ROUTINE                   DESCRIPTION
======================================================================

STATE         EXECUTE       STATE CODE
COUNTY        EXECUTE       COUNTY CODE
ZONE          EXECUTE       TIME ZONE CODE
DAYLITE       EXECUTE       DAYLIGHT SAVINGS FLAG

  VARIABLE LIST: TEMPORAL ALLOCATION FACTOR FILE

NAME          ROUTINE                   DESCRIPTION
======================================================================

TAFCODE         PSTAF       SEASON-DAY CODE
STATE           PSTAF       STATE CODE
COUNTY          PSTAF       COUNTY CODE
SCC             PSTAF       SCC CODE
PLANT_ID        PSTAF       PLANT CODE
POINT_ID        PSTAF       POINT CODE
SEA(NUM_DAY)    PSTAF       SEASONAL FRACTION (1 FOR EACH TAFCODE)
DAY(NUM_DAY)    PSTAF       DAILY FRACTION (1 FOR EACH TAFCODE)
HOUR(NUMHRS)    PSTAF       HOURLY FRACTIONS (24 FOR EACH TAFCODE)

  VARIABLE LIST: ADDITIONS TO EMISSION FILE

NAME          ROUTINE                   DESCRIPTION
======================================================================

ZONE          EXECUTE       GREENWICH MEAN TIME OFFSET
DAYLITE       EXECUTE       DAYLIGHT SAVINGS FLAG
NUM_DAY         PSTAF       NUMBER OF SETS OF TEMPORAL FACTORS
SEA(NUM_DAY)    PSTAF       SEASONAL PERCENTAGE
DAY(NUM_DAY)    PSTAF       DAILY PERCENTAGE
HFGMT(NUMHRS)   PSTAF       HOURLY FRACTIONS OFFSET TO GMT

  VARIABLE LIST: GENERAL
```

NAME	ROUTINE	DESCRIPTION
START	PSTAF	STARTING POINT OF HOUR ARRAY FOR DAY NUM_DAY
FINISH	PSTAF	ENDING POINT OF HOUR ARRAY FOR DAY NUM_DAY
_I_	PSTAF	INDEX FOR ARRAYS
_X_	PSTAF	INDEX FOR NUM_DAY
INDX1	MAIN	TYPE 1 CONTROL RECORD COUNTER
VARS	EXECUTE	MACRO VARIABLE FOR SUBSET CREATION AND SORT
INA	EXECUTE	MERGE INDICATOR
IN1	PSTAF	MERGE INDICATOR
IN2	PSTAF	MERGE INDICATOR
INSTATAF	PSTAF	COUNTER FOR STATE ALLOCATION FACTOR MATCH
INCTYTAF	PSTAF	COUNTER FOR COUNTY ALLOCATION FACTOR MATCH
INSCCTAF	PSTAF	COUNTER FOR SCC ALLOCATION FACTOR MATCH
NOOP	PSTAF	COUNTER FOR UNIFORM PATTERNS ASSIGNED
NOSCC	PSTAF	COUNTER FOR PATTERNS ASSIGNED BY OP RATE DATA
NUMHRS	PSTAF	MACRO VARIABLE FOR SIZE OF ARRAY HOUR
TM	MAIN	SYSTEM TIME
DT	MAIN	SYSTEM DATE
MISS	PSTAF	MACRO VARIABLE FOR TAF DROP LIST
THRU_TOT	PSTAF	SEASONAL THROUGHPUT SUM
GMT	PSTAF	HOUR OF THE DAY IN GMT

ERROR HANDLING:
ERRORS IN THE CONTROL FILE WILL HALT EXECUTION. TEMPORAL ALLOCATION FACTORS MUST HAVE FOR EACH SCC, STATE, COUNTY COMBINATION ONE RECORD FOR EACH DAY IN FILE.

CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

METHOD: TAM INPUTS AND CHECKS THE CONTROL OPTIONS FILE. THE TIMEZONE FILE IS READ, SORTED AND MERGED TO A SUBSET OF THE EMISSIONS FILE. RECORDS WITH NO TIMEZONE DATA ARE PLACED IN A SEPERATE FILE. THE TEMPORAL ALLOCATION FACTORS ARE READ, DIVIDED BY LEVEL OF SPECIFICITY, AND MERGED WITH THE EMISSION FILE. FOR EMISSION RECORDS WITH MISSING TEMPORAL DATA, PATTERNS ARE GENERATED USING OPERATING RATE DATA. THE DIAGNOSTIC REPORT IS PRINTED.

PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, SEPTEMBER 1985
MODIFIED: LYSA LEBOWITZ, ALLIANCE TECHNOLOGIES CORPORATION, SEPTEMBER 1987

MODIFIED: DAVID FRATT, ALLIANCE TECHNOLOGIES CORPORATION, FEBRUARY 1988
ACCOMODATE NEW TAFF AS SAS DATA SET

MODIFIED: DANIEL DULLEBA, ALLIANCE TECHNOLOGIES CORPORATION, MAY 1988
TRACKS HOW MANY TEMPORAL PATTERNS ARE BASED UPON FACTORS, OPERATING DATA, OR UNIFORM DISTRIBUTION AND PRINTS THESE FIGURES IN DIAGNSOTIC REPORT

MODIFIED: DAVID FRATT, ALLIANCE TECHNOLOGIES CORPORATION, SEPTEMBER 1988
MAKE SEASONAL THROUGHPUT DATA THE PRIMARY SOURCE OF SEASONAL FACTORS

MODIFIED: DAVID FRATT, ALLIANCE TECHNOLOGIES CORPORATION, DECEMBER 1988

ACCEPT NEW POINT-LEVEL TEMPORAL FACTORS (FROM TVA DATA)

```
*-----------------------------------------------------------------------*
;
*********************
* MACRO DEFINITIONS *
*********************
;
***** MACRO PSTAF

***** MERGE POINT SOURCE EMISSIONS (FILE TEMP.EMISS) WITH TEMPORAL
      ALLOCATION FACTORS. TAF ARE READ, DIVIDED INTO SPECIFIC LEVELS,
      (SCC, STATE, COUNTY, PLANT ID, POINT ID) AND MERGED. NON-MATCHES
      HAVE PATTERNS GENERATED BASED ON OPERATING DATA, IF PRESENT, OR
      ARE ASSIGNED A UNIFORM DISTRIBUTION.
;
%MACRO PSTAF;
*;
***** INPUT TEMPORAL ALLOCATION FACTORS AND DIVIDE. TAFF IS ASSUMED
      TO BE SORTED BY SCC, STATE, COUNTY, TAFCODE, AS WELL AS QA-ED.
;
%LET TAFDAY=%EVAL(&TAFDAY);
%LET NUMHRS=%EVAL(&TAFDAY*24);
%LET MISS=%STR((DROP=NUM_DAY SEA1-SEA&TAFDAY DAY1-DAY&TAFDAY HOUR1-
     HOUR&NUMHRS));
DATA SCCTAF(DROP=STATE COUNTY PLANT_ID POINT_ID)
     STTAF(DROP=COUNTY PLANT_ID POINT_ID)
     CTYTAF(DROP=PLANT_ID POINT_ID)
     PTTAF;
  SET TAFF.DATA;
  ***** CODE DELETED AS A RESULT OF RECODING TAFF TO SAS DATA SET *****;
  ***** DBF 2/88;
  IF NUM_DAY=&TAFDAY THEN DO;
    IF POINT_ID GT '  ' THEN OUTPUT PTTAF;
    ELSE IF COUNTY NE . THEN OUTPUT CTYTAF;
    ELSE IF STATE NE . THEN OUTPUT STTAF;
    ELSE IF SCC NE . THEN OUTPUT SCCTAF;
  END;
*;
***** MERGE TAF FILES WITH TEMP.EMISS
;
*---- POINT SPECIFIC
;
DATA TEMP1.PT TEMP1.NOPT&MISS;
  MERGE PTTAF(IN=IN2) TEMP.EMISS(IN=IN1) END=EOF;
  BY SCC STATE COUNTY PLANT_ID POINT_ID;
  %GLOBAL INPTTAF;
  DROP INPTTAF;
  IF _N_ = 1 THEN INPTTAF=0;
  IF IN1 AND IN2 THEN DO;
     INPTTAF+1; OUTPUT TEMP1.PT;
  END;
  ELSE IF IN1 THEN OUTPUT TEMP1.NOPT;
  IF EOF THEN DO;
     CALL SYMPUT('INPTTAF',INPTTAF);
  END;
;
*---- COUNTY SPECIFIC
;
```

```
 DATA TEMP1.CTY TEMP2.NOCTY&MISS;
   MERGE CTYTAF(IN-IN2) TEMP1.NOPT(IN-IN1) END-EOF;
   BY SCC STATE COUNTY;
   %GLOBAL INCTYTAF;
   DROP INCTYTAF;
   IF _N_ - 1 THEN INCTYTAF-0;
   IF IN1 AND IN2 THEN DO;
      INCTYTAF+1; OUTPUT TEMP1.CTY;
   END;
   ELSE IF IN1 THEN OUTPUT TEMP2.NOCTY;
   IF EOF THEN DO;
      CALL SYMPUT('INCTYTAF',INCTYTAF);
   END;
*;
*---- STATE SPECIFIC
;
DATA TEMP3.ST TEMP1.NOST&MISS;
  MERGE STTAF(IN-IN2) TEMP2.NOCTY(IN-IN1) END-EOF;
  BY SCC STATE;
  %GLOBAL INSTATAF;
  IF _N_ - 1 THEN INSTATAF-0;
  IF IN1 AND IN2 THEN DO;
     INSTATAF+1; OUTPUT TEMP3.ST;
  END;
  ELSE IF IN1 THEN OUTPUT TEMP1.NOST;
  IF EOF THEN DO;
     CALL SYMPUT('INSTATAF',INSTATAF);
  END;
*;
*---- SCC SPECIFIC
;
DATA TEMP4.SCC TEMP5.NOSCC TEMP2.NOOP;
  MERGE SCCTAF(IN-IN2) TEMP1.NOST(IN-IN1) END-EOF;
  BY SCC;
  %GLOBAL INSCCTAF NOSCC NOOP;
  THRU_TOT-WINTHRU+SPRTHRU+SUMTHRU+FALTHRU;

  ARRAY SEA SEA1-SEA&TAFDAY;
  ARRAY DAY DAY1-DAY&TAFDAY;
  ARRAY HOUR HOUR1-HOUR&NUMHRS;
  DROP X START FINISH THRU_TOT INSCCTAF NOSCC NOOP;
  IF _N_ -1 THEN DO;
    INSCCTAF-0; NOSCC-0; NOOP-0;
  END;
  IF IN1 AND IN2 THEN DO;
    INSCCTAF+1; OUTPUT TEMP4.SCC;
  END;
*;
*---- GENERATE PATTERNS BASED ON OPERATING RATE DATA, IF PRESENT.
;
  ELSE IF IN1 AND THRU_TOT GE 90 AND THRU_TOT LE 110
       AND WEEKS NE . AND DAYS NE . AND HOURS NE .
       THEN DO;
     NOSCC+1;
     NUM_DAY-&TAFDAY;
*;
*     CHECK SEASONAL THROUGHPUT TOTAL, NORMALIZE IF NECESSARY
;
   IF THRU_TOT NE 100 THEN DO;
```

```
      WINTHRU=(WINTHRU/THRU_TOT)*100;
      SPRTHRU=(SPRTHRU/THRU_TOT)*100;
      SUMTHRU=(SUMTHRU/THRU_TOT)*100;
      FALTHRU=(FALTHRU/THRU_TOT)*100;
    END;
*;
*     SEASONAL FRACTIONS
;
    SEA1=WINTHRU/100;SEA2=WINTHRU/100;SEA3=WINTHRU/100;
    SEA4=SPRTHRU/100;SEA5=SPRTHRU/100;SEA6=SPRTHRU/100;
    SEA7=SUMTHRU/100;SEA8=SUMTHRU/100;SEA9=SUMTHRU/100;
    SEA10=FALTHRU/100;SEA11=FALTHRU/100;SEA12=FALTHRU/100;
*;
*     DAILY FRACTIONS
;
    DO _I_=1 TO 12;
      IF DAYS=3 OR DAYS=4 THEN DAY=1/(13*5);
      ELSE DAY=1/(13*DAYS);
    END;
    IF DAYS=1 THEN DO;
      DAY1=0;
      DAY3=0;DAY4=0;
      DAY6=0;DAY7=0;
      DAY9=0;DAY10=0;
      DAY12=0;
    END;
    IF DAYS=2 THEN DO;
      DAY1=0;
      DAY4=0;
      DAY7=0;
      DAY10=0;
    END;
    IF DAYS>=3 AND DAYS<=5 THEN DO;
      DAY2=0;DAY3=0;
      DAY5=0;DAY6=0;
      DAY8=0;DAY9=0;
      DAY11=0;DAY12=0;
    END;
    IF DAYS=6 THEN DO;
      DAY3=0;
      DAY6=0;
      DAY9=0;
      DAY12=0;
    END;
*;
*     HOURLY FRACTIONS
;
    DO _I_=1 TO &NUMHRS;
      HOUR=1/HOURS;
    END;
    IF HOURS>=17 THEN DO;
      DO X=1 TO NUM_DAY;
        START=(X-1)*24+1+HOURS;
        FINISH=START+23-HOURS;
        DO _I_=START TO FINISH;
          HOUR=0;
        END;
      END;
    END;
    ELSE DO;
      DO X=1 TO NUM_DAY;
        START=(X-1)*24+1;
        FINISH=START+6;
        DO _I_=START TO FINISH;
          HOUR=0;
        END;
        FINISH=START+23;
        START=START+HOURS+7;
        DO _I_=START TO FINISH;
          HOUR=0;
        END;
      END;
    END;
    OUTPUT TEMP5.NOSCC;
  END;
*;
*---- GENERATE UNIFORM PATTERNS-NO OPERATING DATA.
;
  ELSE IF IN1 THEN DO;
*;
*     SEASONAL AND DAILY FRACTIONS
;
    NOOP+1;
    NUM_DAY=&TAFDAY;
    DO _I_=1 TO NUM_DAY;
      SEA=0.250;
      DAY=1/91;   *** CHANGED FROM APPROXIMATION -DBF 2/88;
    END;
*;
*     HOURLY FRACTIONS
;
    DO _I_=1 TO &NUMHRS;
      HOUR=1/24;  *** CHANGED FROM APPROXIMATION -DBF 2/88;
    END;
    OUTPUT TEMP2.NOOP;
  END;
  IF EOF THEN DO;
     CALL SYMPUT('INSCCTAF',INSCCTAF);
     CALL SYMPUT('NOSCC',NOSCC);
     CALL SYMPUT('NOOP',NOOP);
  END;
*;
***** MERGE SUBFILES TO FORM FINAL, TEMPORALLY RESOLVED EMISSIONS FILE;
;
DATA OUTFILE.&SASMEM(DROP=HOURS DAYS WEEKS WINTHRU SPRTHRU SUMTHRU
  FALTHRU HOUR1-HOUR&NUMHRS);
  SET TEMP1.PT TEMP1.CTY TEMP3.ST TEMP4.SCC TEMP5.NOSCC TEMP2.NOOP;
  BY SCC STATE COUNTY PLANT_ID POINT_ID;

  ****************************************************************
  *** IF THROUGHPUT DATA PRESENT, THESE USED FOR SEASONAL FACTORS **
  ****************************************************************
  ;
  THRU_TOT=WINTHRU+SPRTHRU+SUMTHRU+FALTHRU;
  IF THRU_TOT GE 90 AND THRU_TOT LE 110 THEN DO;

    IF THRU_TOT NE 100 THEN DO;
        WINTHRU=(WINTHRU/THRU_TOT)*100;
        SPRTHRU=(SPRTHRU/THRU_TOT)*100;
        SUMTHRU=(SUMTHRU/THRU_TOT)*100;
        FALTHRU=(FALTHRU/THRU_TOT)*100;
        PUT '*** WARNING: SEASONAL THROUGHPUTS NORMALIZED FOR'/
            '             SCC: ' SCC Z8. ' STATE: ' STATE Z2.
            ' COUNTY: ' COUNTY Z4. ' PLANT: ' PLANT_ID $4.
            ' POINT: ' POINT_ID $2. ' ' ;
    END;

    SEA1=WINTHRU/100;SEA2=WINTHRU/100;SEA3=WINTHRU/100;
    SEA4=SPRTHRU/100;SEA5=SPRTHRU/100;SEA6=SPRTHRU/100;
    SEA7=SUMTHRU/100;SEA8=SUMTHRU/100;SEA9=SUMTHRU/100;
    SEA10=FALTHRU/100;SEA11=FALTHRU/100;SEA12=FALTHRU/100;
  END;

ARRAY HOUR(Y) HOUR1-HOUR&NUMHRS;
ARRAY HFGMT(Z) HFGMT1-HFGMT&NUMHRS;
*;
*---- OFFSET TO GMT;
*;
DO X=0 TO 11;
 DO Y=((X*24)+1) TO ((X*24)+24);
 ***CHECK FOR DAYLIGHT SAVINGS TIME****;
  IF Y GE 73 AND Y LE 216 THEN ZONE1=ZONE-DAYLITE;
    ELSE ZONE1=ZONE;
   Z=ZONE1+Y;
    IF Z GT ((X*24)+24) THEN Z=Z-24;
   HFGMT=HOUR;
  END;
 END;
DROP X Y Z ZONE1;
%MEND PSTAF;
*

;
***** MACRO EXECUTE

***** CONTROLS TAM PROCESSING BASED ON SOURCE TYPE BY ATTACHING
      TIME ZONE FILE AND CALLING PROPER TAF MERGE MACRO.
;
%MACRO EXECUTE;
*;
***** INPUT AND SORT TIME ZONE FILE.
;
DATA TIMEZONE; INFILE TZF;
  INPUT @1 STATE 2. COUNTY 4. ZONE 1. DAYLITE 1.;
*;
*     ADJUST TO GREENWICH MEAN TIME.
;
  ZONE=ZONE+4;
*;
PROC SORT DATA=TIMEZONE; BY STATE COUNTY;
*;
***** SUBSET EMISSION FILE IN ORDER TO RE-SORT AND MERGE WITH TIMEZONE.
      PROCESSING IS DIFFERENT FOR AREA AND POINT SOURCES.
;
%LET VARS=%STR(SCC STATE COUNTY PLANT_ID POINT_ID);
DATA SUBSET(KEEP=&VARS); SET INFILE.&SASMEM;
*;
*---- SORT SUBSET
```

```
;
PROC SORT DATA=SUBSET; BY STATE COUNTY;
*;
*---- MERGE SUBSET WITH TIMEZONE OUTPUT
;
DATA SUBTIME; MERGE SUBSET(IN=INA) TIMEZONE;
  BY STATE COUNTY;
  IF INA;
*;
*---- RE-SORT SUBTIME
;
PROC SORT DATA=SUBTIME; BY &VARS;
*;
*---- MERGE BACK TO MAIN FILE. RECORDS NO TZF DATA ARE OUTPUT TO NOTIME
;
DATA TEMP.EMISS ORPHAN.NOTIME(DROP=ZONE DAYLITE);
  MERGE INFILE.&SASMEM SUBTIME;
  BY &VARS;
  IF ZONE NE . THEN OUTPUT TEMP.EMISS;
  ELSE OUTPUT ORPHAN.NOTIME;
*;
***** APPLY TEMPORAL ALLOCATION FACTORS
;
%PSTAF
*;
%MEND EXECUTE;
*
;
***** MACRO DETAIL

***** PRINT OUT TEMPORALLY RESOLVED EMISSION FILE.
;
%MACRO DETAIL;
%*;
*;
*---- PRINT IDENTITY OF RECORDS WITH NO TIMEZONE DATA.
;
PROC PRINT DATA=ORPHAN.NOTIME;
  VAR STATE COUNTY;
  TITLE 'STATE-COUNTY CODES WITHOUT TIMEZONE DATA';
  FORMAT STATE Z2. COUNTY Z4.;
*;
*---- PRINT TEMPORALLY RESOLVED EMISSION FILE IF REQUESTED.
;
%IF &DETAIL=D %THEN %DO;
  PROC PRINT DATA=OUTFILE.&SASMEM(OBS=10) UNIFORM;
  ID SCC STATE COUNTY PLANT_ID POINT_ID;
  FORMAT SCC Z8. STATE Z2. COUNTY Z4. PLANT_ID $4. POINT_ID $2.
    NUM_DAY 2. SEA1-SEA12 4.3 DAY1-DAY12 5.4 HFGMT1-HFGMT288 4.3
    ZONE Z1. DAYLITE Z1. ;
  VAR ZONE DAYLITE NUM_DAY SEA1-SEA12 DAY1-DAY12
       HFGMT1-HFGMT288;
  TITLE 'EMPLOYED TEMPORAL FACTORS - FIRST 10 OBSERVATIONS';
%END;
%*;
%MEND DETAIL;
*
;
*************************
```

```
* END MACRO DEFINITIONS *
*************************
*;
*********************
* MAIN PROGRAM: TAM *
*********************

***** THIS PROGRAM WILL:
                1. READ THE CONTROL OPTIONS FILE.
                2. READ THE TIMEZONE FILE AND MERGE WITH EMISSIONS FILE.
                3. READ, SORT AND SUBDIVIDE TEMPORAL ALLOCATION FACTORS.
                4. MERGE FACTORS WITH EMISSION RECORDS.
                5. GENERATE FACTORS FOR EMISSION RECORDS WITHOUT TAF.
                6. PRODUCE DIAGNOSTIC REPORT.
 ;
***** READ CONTROL FILE.
 ;
DATA ONE(DROP=TYPE);INFILE COF EOF=WRITE;
  RETAIN SCE DETAIL SASMEM TAFDAY RUN_ID;
  INPUT @1 TYPE 1. @;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION)
 ;
  IF TYPE=1 THEN DO;
*;
*     CHECK FOR TOO MANY TYPE 1 RECORDS
 ;
    INDX1+1;
    IF INDX1>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN COF';
      ABORT;
    END;
*;
*     INPUT AND CHECK DATA
 ;
    INPUT @3 SCE $2. @6 DETAIL $1. @8 SASMEM $8. @17 TAFDAY 2. @20

          RUN_ID $52.;
    IF SCE NE 'PS' THEN DO;
      PUT '*** FATAL: INVALID SOURCE TYPE ' SCE=;
      ABORT;
    END;
    IF DETAIL NE 'D' AND DETAIL NE 'S' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT ' DETAIL=;
      ABORT;
    END;
    RETURN;
  END;
*;
*---- INVALID CONTROL RECORD
 ;
  IF TYPE NE 1 THEN DO;
    PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
    ABORT;
  END;
*;
*---- OUTPUT CONTROL FILE DATA
 ;
WRITE: OUTPUT;
```

```
*;
*---- CREATE MACRO VARIABLES FOR TAM PROCESSING
;
CALL SYMPUT('TAFDAY',TAFDAY);
CALL SYMPUT('SASMEM',SASMEM);
RUN;
*;
***** CALL TAM PROCESSING MACRO
;
%EXECUTE
*;
***** DIAGNOSTIC REPORT
;
DATA _NULL_;SET ONE;
  FILE PRINT NOTITLES;
  IF DETAIL-'D' THEN REPO-'DETAILED';ELSE REPO-' SUMMARY';
  DT-DATE();TM-TIME();
  RUNCOL-66-LENGTH(RUN_ID)/2;
  INSTATAF-&INSTATAF; INCTYTAF-&INCTYTAF; INSCCTAF-&INSCCTAF;
  INPTTAF-&INPTTAF; NOSCC-&NOSCC; NOOP-&NOOP;
*;
*---- PRINT HEADER
;
  PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
      @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
      @100 'TEMPORAL ALLOCATION MODULE (TAM)'//
      @2 'DIAGNOSTIC REPORT'
      @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
      'CONTROL FILE LISTING' @77 55*'-'//;
*;
*---- TYPE 1 RECORD
;
  PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SOURCE: ' SCE ' DETAIL: '
      DETAIL ' RUN ID: ' RUN_ID//@44
      'NUMBER OF DAYS IN TEMPORAL ALLOCATION FILE: ' TAFDAY /////
      @7 'NUMBER OF RECORDS WITH TEMPORAL PATTERNS BASED ON :'
      @59 'POINT TAF MATCH    ' INPTTAF  /
      @59 'COUNTY TAF MATCH   ' INCTYTAF /
      @59 'STATE  TAF MATCH   ' INSTATAF /
      @59 'SCC   TAF MATCH    ' INSCCTAF /
      @59 'OPERATING DATA     ' NOSCC /
      @59 'UNIFORM PATTERN    ' NOOP ;
  PUT _PAGE_;
*;
*---- END OF SUMMARY REPORT. CALL MACRO FOR DETAILED REPORT.
;
CALL SYMPUT('DETAIL',DETAIL);
CALL SYMPUT('SASMEM',SASMEM);
RUN;
%DETAIL
*;
************************
* END OF MAIN PROGRAM *
************************
;
```

```
OPTIONS DQUOTE MPRINT;
*-----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: TEMPORAL ALLOCATION MODULE (TAM) - AREA SOURCES

  LANGUAGE: SAS (VERSION 5.08)

  PURPOSE: TO APPLY TEMPORAL ALLOCATION FACTORS AND TIMEZONE DATA
           TO EMISSION RECORDS.

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME          ROUTINE                  DESCRIPTION
=========================================================================
TYPE            MAIN       CONTROL OPTIONS RECORD TYPE
SCE             MAIN       SOURCE TYPE OF EMISSION FILE
DETAIL          MAIN       LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
SASMEM          MAIN       SAS MEMBER NAME OF INPUT EMISSION FILE
TAFDAY          MAIN       NUMBER OF TEMPORAL SCENARIO DESIRED
RUN_ID          MAIN       RUN IDENTIFICATION HEADER
DAYLITE         MAIN       DAYLIGHT SAVINGS INDICATOR
LIST            MAIN       POLLUTANT VARIABLE LIST
EMRES           MAIN       EMISSIONS RESOLUTION SPECIFICATION

  VARIABLE LIST: TEMPORAL ALLOCATION FACTOR FILE

NAME          ROUTINE                  DESCRIPTION
=========================================================================
TAFCODE         ASTAF     SEASON-DAY CODE
STATE           ASTAF     STATE CODE
COUNTY          ASTAF     COUNTY CODE
SCC             ASTAF     SCC CODE
SEA             ASTAF     SEASONAL FRACTION
DAY             ASTAF     DAILY FRACTION
HOUR1-24        ASTAF     HOURLY FRACTIONS

  VARIABLE LIST: ADDITIONS TO EMISSION FILE

NAME          ROUTINE                  DESCRIPTION
=========================================================================
GMT1-24         ASTAF     TEMPORAL FRACTIONS OFFSET TO GMT

  VARIABLE LIST: GENERAL

NAME          ROUTINE                  DESCRIPTION
=========================================================================
START           ASTAF     STARTING POINT OF HOUR ARRAY FOR DAY NUM_DAY
FINISH          ASTAF     ENDING POINT OF HOUR ARRAY FOR DAY NUM_DAY
_I_             ASTAF     INDEX FOR ARRAYS
INDX1           MAIN      TYPE 1 CONTROL RECORD COUNTER
IN1             ASTAF     MERGE INDICATOR
IN2             ASTAF     MERGE INDICATOR
NUMHRS          ASTAF     MACRO VARIABLE FOR SIZE OF ARRAY HOUR
TM              MAIN       SYSTEM TIME
DT              MAIN       SYSTEM DATE
MISS            ASTAF     MACRO VARIABLE FOR TAF DROP LIST
```

```
  ERROR HANDLING:
     ERRORS IN THE CONTROL FILE WILL HALT EXECUTION. TEMPORAL ALLOCATION
     FACTORS MUST HAVE FOR EACH SCC, STATE, COUNTY COMBINATION ONE
     RECORD FOR EACH DAY IN FILE.

  CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

  METHOD: TAM INPUTS AND CHECKS THE CONTROL OPTIONS FILE.
          THE TEMPORAL ALLOCATION FACTORS ARE READ, DIVIDED BY
          LEVEL OF SPECIFICITY, AND MERGED WITH THE EMISSION FILE.
          FOR EMISSION RECORDS WITH MISSING TEMPORAL DATA, PATTERNS ARE
          GENERATED USING OPERATING RATE DATA. THE DIAGNOSTIC REPORT IS
          PRINTED.

PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, SEPTEMBER 1985
  UPDATED:    DON NEAL JULY 1986
              ANDREW ACKERMAN, ALLIANCE TECH CORP, JUNE 1987

  UPDATED:  DAVID FRATT,   ALLIANCE TECHNOLOGIES CORPORATION,
            FEBRUARY 1988
            ACCOMODATE NEW TAFF AS SAS DATA SET

*-----------------------------------------------------------------------*
;
*********************
* MACRO DEFINITIONS *
*********************
;
***** MACRO ASTAF

***** MERGE AREA SOURCE EMISSIONS (FILE TEMP.EMISS) WITH TEMPORAL
      ALLOCATION FACTORS. TAF ARE READ, DIVIDED INTO SPECIFIC LEVELS
      (SCC, STATE, COUNTY) AND MERGED. NON-MATCHES ARE ASSIGNED
      A UNIFORM DISTRIBUTION.

;
%MACRO ASTAF;
*;
***** INPUT TEMPORAL ALLOCATION FACTORS AND DIVIDE. TAFF IS ASSUMED
      TO BE SORTED BY SCC, STATE, COUNTY, TAFCODE, AS WELL AS QA-ED.

;
%LET TAFDAY-%EVAL(&TAFDAY);
%LET MISS-%STR((DROP-NUM_DAY SEA DAY HOUR1-HOUR24));
%LET EMRES-%SUBSTR(&EMRES,1,1);
DATA SCCTAF(DROP-STATE) STTAF;
  SET TAFF.DATA;
  ***** CODE DELETED AS A RESULT OF RECODING TAFF TO SAS DATA SET *****;
  ***** DBF 2/88;
  ARRAY HOUR HOUR1-HOUR24;
  DROP SEA DAY;
  IF NUM_DAY-&TAFDAY ;
*;
*    MULTIPLY HOURLY DATA BY SEASONAL AND DAILY FACTORS;
*;
    DO _I_-1 TO 24;
      HOUR-HOUR*SEA*DAY;
    END;
*;
*     OUTPUT DATA TO PROPER FILE;
*;
```

```
      IF STATE NE . THEN OUTPUT STTAF;
      ELSE OUTPUT SCCTAF;
 *;
 *;
 ***** MERGE TAF FILES WITH TEMP.EMISS
 ;
 *;
 *---- STATE SPECIFIC
 ;
 DATA STATE.DATA TEMP.NOSTATE&MISS;
   MERGE STTAF(IN=IN2) TAMIN.&SASMEM(IN=IN1) END=EOF;
   BY SCC STATE;
   %GLOBAL INSTATAF;
   DROP INSTATAF;
   IF _N_ = 1 THEN INSTATAF=0;
   IF IN1 AND IN2 THEN DO;
      INSTATAF+1; OUTPUT STATE.DATA;
   END;
   ELSE IF IN1 THEN OUTPUT TEMP.NOSTATE;
   *IF EOF THEN DO;
      CALL SYMPUT('INSTATAF',INSTATAF);
   *END;
 *;
 *---- SCC SPECIFIC
 ;
 DATA SCC.DATA;
   MERGE SCCTAF(IN=IN2) TEMP.NOSTATE(IN=IN1) END=EOF;
   BY SCC;
   %GLOBAL INSCCTAF UNITAF;
   DROP INSCCTAF UNITAF;
   IF _N_ = 1 THEN DO;
      INSCCTAF=0; UNITAF=0;
   END;
   ARRAY HOUR HOUR1-HOUR24;
      CALL SYMPUT('INSCCTAF',INSCCTAF);
      CALL SYMPUT('UNITAF',UNITAF);
   IF IN1;
 *;
 *---- OUTPUT IF TEMPORAL FACTORS PRESENT OTHERWISE UNIFORM PATTERN;
 *;
   IF HOUR1 NE . THEN DO;
     INSCCTAF+1; OUTPUT;
      CALL SYMPUT('INSCCTAF',INSCCTAF);
   END;
   ELSE DO;
     UNITAF+1;
      CALL SYMPUT('UNITAF',UNITAF);
     DO OVER HOUR;
       HOUR=0.0001141553;  *** ELIM APPROXIMATION -DBF 3/88;
     END;
     OUTPUT;
   END;
   *IF EOF THEN DO;
      CALL SYMPUT('INSCCTAF',INSCCTAF);
      CALL SYMPUT('UNITAF',UNITAF);
   *END;
 *;
 ***** MERGE SUBFILES TO FORM FINAL, TEMPORALLY RESOLVED EMISSIONS FILE.
 ;
```

```
  DATA TAMOUT;
    SET STATE.DATA SCC.DATA;
    FILE SORTIN;
    BY SCC STATE;
    ARRAY HOUR HOUR1-HOUR24;
    ARRAY GMT(A) GMT1-GMT24;
    DROP A ZONE DAYLITE HOUR1-HOUR24;
*;
*---- OFFSET HOURLY DATA TO GMT
*;
*     CHECK FOR DAYLIGHT SAVINGS TIME;
*;
%IF &DAYLITE=Y %THEN %DO;
  ZONE=ZONE-DAYLITE;
%END;
*;
*     OFFSET HOURLY FRACTIONS;
*;
    DO _I_=1 TO 24;
      A=ZONE+_I_;
      IF A>24 THEN A=A-24;
      GMT=HOUR;
    END;
*;
*---- OUTPUT OBSERVATION IN EBCDIC;
*;
  %IF &EMRES=G %THEN
    %LET EMID=%STR(COL 4. ROW 4.);
  %ELSE
    %LET EMID=%STR(SCC 8. STATE 2. COUNTY 4.);
*;
  PUT @1 &EMID (&LIST GMT1-GMT24) (E10.);
*;
*---- OUTPUT TO TAMOUT FOR DETAILED REPORT;
*;
  IF FIRST.STATE;
*;
%MEND ASTAF;
*
;
;
;
***** MACRO DETAIL

***** PRINT OUT TEMPORALLY RESOLVED EMISSION FILE.
;
%MACRO DETAIL;
%*;
*;
*---- PRINT TEMPORALLY RESOLVED EMISSION FILE IF REQUESTED.
;
%IF &DETAIL=D %THEN %DO;
  PROC PRINT DATA=TAMOUT(OBS=30);
  ID SCC STATE;
  FORMAT SCC Z8. STATE Z2.;
  VAR GMT1-GMT24;
  TITLE 'TAM ADDITIONS TO EMISSION RECORDS  (30 OBS)';
%END;
%*;
```

```
%MEND DETAIL;
*
;
*************************
* END MACRO DEFINITIONS *
*************************
*;
*********************
* MAIN PROGRAM: TAM *
*********************

***** THIS PROGRAM WILL:
                1. READ THE CONTROL OPTIONS FILE.
                2. READ, SUBSET, SORT AND SUBDIVIDE TAFS
                3. MERGE FACTORS WITH EMISSION RECORDS.
                4. OFFSET HOURLY FACTORS TO GMT.
                5. SORT BY COLUMN AND ROW.
                6. OUTPUT DATA IN EBCDIC.
                7. PRODUCE DIAGNOSTIC REPORT.
;
***** READ CONTROL FILE.
;
DATA ONE(DROP-TYPE);INFILE COF EOF-WRITE;
  RETAIN SCE DETAIL SASMEM TAFDAY RUN_ID LIST DAYLITE EMRES;
  INPUT @1 TYPE 1. @;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION)
;
  IF TYPE-1 THEN DO;
*;
*     CHECK FOR TOO MANY TYPE 1 RECORDS
;
    INDX1+1;
    IF INDX1>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN COF';
      ABORT;
    END;
*;
*     INPUT AND CHECK DATA
;
    INPUT @3 SCE $2. @6 DETAIL $1. @8 SASMEM $8. @17 TAFDAY 2. @20
           DAYLITE $1. @22 RUN_ID $50.;
    IF SCE NE 'AS' THEN DO;
      PUT '*** FATAL: INVALID SOURCE TYPE ' SCE-;
      ABORT;
    END;
    IF DETAIL NE 'D' AND DETAIL NE 'S' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT ' DETAIL-;
      ABORT;
    END;
    IF DAYLITE NE 'Y' AND DAYLITE NE 'N' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DAYLIGHT SAVINGS TIME';
      ABORT;
    END;
    RETURN;
  END;
*;
*---- TYPE 2 CONTROL RECORD (POLLUTANT VARIABLE LIST);
*;
```

```
   IF TYPE=2 THEN DO;
 *;
 *    CHECK FOR TOO MANY TYPE 2 RECORDS;
 *;
     INDX2+1;
     IF INDX2>1 THEN DO;
       PUT '*** FATAL: MORE THAN ONE TYPE 2 RECORD IN COF';
       ABORT;
     END;
 *;
 *     INPUT DATA;
 *;
     INPUT @3 LIST $70.;
 *;
     RETURN;
   END;
 *;
 *---- TYPE 3 CONTROL RECORD (EMISSIONS RESOLUTION);
 *;
   IF TYPE=3 THEN DO;
 *;
 *    CHECK FOR TOO MANY TYPE 3 RECORDS;
 *;
     INDX3+1;
     IF INDX3>1 THEN DO;
       PUT '*** FATAL: MORE THAN ONE TYPE 3 RECORD IN COF';
       ABORT;
     END;
 *;
 *     INPUT AND CHECK DATA;
 *;
     INPUT @3 EMRES $10.;
     IF EMRES NE 'GRIDDED' AND EMRES NE 'NONGRIDDED' THEN DO;
       PUT '*** FATAL: INVALID OPTION FOR EMISSIONS RESOLUTION' EMRES=;
       ABORT;
     END;
 *;
     RETURN;
   END;
 *;
 *---- INVALID CONTROL RECORD
 ;
   IF TYPE <1 OR TYPE >3 THEN DO;
     PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
     ABORT;
   END;
 *;
 *---- OUTPUT CONTROL FILE DATA
 ;
 WRITE: OUTPUT;
 *;
 *---- CREATE MACRO VARIABLES FOR TAM PROCESSING
 ;
 CALL SYMPUT('TAFDAY',TAFDAY);
 CALL SYMPUT('SASMEM',SASMEM);
 CALL SYMPUT('LIST',LIST);
 CALL SYMPUT('DAYLITE',DAYLITE);
 CALL SYMPUT('EMRES',EMRES);
 RUN;
```

```
*;
***** CALL TAM PROCESSING MACRO
;
%ASTAF
*;
***** DIAGNOSTIC REPORT
;
DATA _NULL_;SET ONE;
  FILE PRINT NOTITLES;
  IF DETAIL='D' THEN REPO='DETAILED';ELSE REPO=' SUMMARY';
  DT=DATE();TM=TIME();
  RUNCOL=66-LENGTH(RUN_ID)/2;
  INSTATAF=&INSTATAF; INSCCTAF=&INSCCTAF; UNITAF=&UNITAF;
*;
*---- PRINT HEADER
;
  PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
      @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
      @100 'TEMPORAL ALLOCATION MODULE (TAM)'//
      @2 'DIAGNOSTIC REPORT'
      @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
      'CONTROL FILE LISTING' @77 55*'-'//;
*;
*---- TYPE 1 RECORD
;
  PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SOURCE: ' SCE ' DETAIL: '
      DETAIL ' RUN ID: ' RUN_ID//@44
      'TEMPORAL SCENARIO PROCESSED: ' TAFDAY//;
*;
*---- TYPE 2 RECORD
*;
  PUT @2 'POLLUTANT IDENTIFICATION RECORD:'//@7 'VARIABLE LIST: '
          LIST $70.//;
*;
*---- TYPE 3 RECORD
*;
  PUT @2 'EMISSIONS RESOLUTION RECORD:'//@7 'EMISSIONS RESOLUTION: '
         EMRES ///;
  PUT @7 'NUMBER OF RECORDS WITH TEMPORAL PATTERNS BASED ON :'
      @59 'STA TAF MATCH   ' INSTATAF /
      @59 'SCC TAF MATCH   ' INSCCTAF /
      @59 'UNIFORM PATTERN ' UNITAF   ;
  PUT _PAGE_;
*;
*---- END OF SUMMARY REPORT. CALL MACRO FOR DETAILED REPORT.
;
CALL SYMPUT('DETAIL',DETAIL);
RUN;
%DETAIL
*;
***********************
* END OF MAIN PROGRAM *
***********************
;
```

```
C*********************************************************************
      PROGRAM MTPREP
C*********************************************************************
C
C    MTPREP - TAM AREA SOURCE MODELER'S TAPE PREPROCESSOR
C
C    PROGRAM TAKES EMISSIONS WITH HOURLY TEMPORAL ALLOCATION
C    FACTORS, MULTIPLIES THEM, AND CALCULATES TOTALS.
C    FOR GRIDDED EMISSIONS (INDICATED BY EMRES IN COF),
C    TOTALS ARE CALCULATED FOR EACH COL, ROW PAIR;
C    FOR NON-GRIDDED EMISSIONS, TOTALS ARE CALCULATED FOR EACH
C    SCC, STATE, COUNTY COMBINATION.
C
C    INPUT
C      CONTROL OPTIONS FILE - FT10F001
C      EMISSIONS            - FT11F001
C    OUTPUT                 - FT20F001
C
C    PROGRAMMER - ANDREW ACKERMAN, ALLIANCE TECH CORP, JUNE 1987
C    MODIFIED BY JOHN LANGSTAFF MARCH 1988.
C
C*********************************************************************
      CHARACTER*10 EMRES

C    READ NUMBER OF POLLUTANTS (NPOLL) AND EMISSIONS RESOLUTION (EMRES)
      READ(10,10) NPOLL,EMRES
   10 FORMAT(I3,1X,A10)

      PRINT 83,NPOLL,EMRES
83    FORMAT(//'  MTPREP:  NPOLL -',I4,'    EMRES - ',A10)

C    CHECK COF AND CALL APPROPRIATE SUBROUTINE FOR PROCESSING
      IF (NPOLL.NE.14.AND.NPOLL.NE.20.AND.NPOLL.NE.37) THEN
        PRINT 20,NPOLL
   20   FORMAT(1X,'*** FATAL:  NUMBER OF POLLUTANTS SPECIFIED IN COF ',
     &          'DOES NOT EQUAL 14, 20 OR 37, NPOLL-',I4,
     $       //' MTPREP.FORT MUST BE MODIFIED TO ACCOMODATE A',
     $          ' DIFFERENT NUMBER OF POLLUTANTS.')
        STOP
      ELSE
        IF (EMRES.EQ.'GRIDDED   '.AND.NPOLL.EQ.14) THEN
          CALL GRD14(NPOLL)
        ELSE
        IF (EMRES.EQ.'GRIDDED   '.AND.NPOLL.EQ.20) THEN
          CALL GRD20(NPOLL)
        ELSE
        IF (EMRES.EQ.'GRIDDED   '.AND.NPOLL.EQ.37) THEN
          CALL GRD37(NPOLL)
        ELSE
          IF (EMRES.EQ.'NONGRIDDED') THEN
            CALL NONGRD(NPOLL)
          ELSE
            PRINT 30,EMRES
   30       FORMAT(1X,'*** FATAL:  INVALID EMISSIONS RESOLUTION ',
     &             'SPECIFIED IN COF, EMRES-',A10)
            STOP
          ENDIF
        ENDIF
      ENDIF
      ENDIF
      ENDIF

      END
C***********************************************************************
      SUBROUTINE GRD14(NPOLL)

C     THIS ROUTINE PROCESSES GRIDDED AREA SOURCE EMISSIONS,
C     READS THE EMISSIONS FILE OUTPUT FROM SYNCSORT (TAM STEP 2),
C     MULTIPLYING THE ANNUAL EMISSIONS BY TEMPORAL FACTORS TO OBTAIN
C     HOURLY EMISSIONS FOR THE SCENARIO,
C     SUMS EMISSIONS TO OBTAIN TOTALS FOR EACH GRID CELL, AND
C     WRITES THESE TEMPORALLY ALLOCATED EMISSIONS TO A FILE.
C     AREA DIMENSIONS.....

C     CODED 3/3/88 BY JOHN LANGSTAFF TO REDUCE PROCESSING TIME.

C     VARIABLES:
C     NPOLL - THE NUMBER OF POLLUTANTS
C     COL,ROW,COLOLD,ROWOLD - COLUMN AND ROW NUMBERS OF A GRID CELL
C     FACT(*) - THE 24 HOURLY TEMPORAL ALLOCATION FACTORS
C     TOT(IHR,SPECIES) - ARRAY OF HOURLY EMISSIONS TOTALS
C     POLL(NPOLL) - ARRAY OF ANNUAL EMISSIONS


      REAL POLL(14), FACT(24), TOT(24,14)
      INTEGER COL, ROW, COLOLD, ROWOLD

C     *** READ THE FIRST RECORD
      READ(11,1000) COLOLD, ROWOLD, POLL, FACT
1000  FORMAT(2I4,61E10.3)

C     *** MULTIPLY EMISSIONS BY FACTORS AND INITIALIZE THE TOTALS
      DO 100 IPOLL = 1, NPOLL
      DO 100 IHR = 1, 24
100   TOT(IHR,IPOLL) = FACT(IHR) * POLL(IPOLL)

C     *** READ THE NEXT EMISSIONS RECORD
200   READ(11,1000,END=700) COL, ROW, POLL, FACT

C     *** CHECK TO SEE WHETHER COL,ROW HAVE CHANGED
      IF(ROW.NE.ROWOLD) GO TO 400
      IF(COL.NE.COLOLD) GO TO 400

C     *** COL,ROW HAVE NOT CHANGED
C     *** MULTIPLY EMISSIONS BY FACTORS AND UPDATE THE TOTALS
      DO 300 IPOLL = 1, NPOLL
      DO 300 IHR = 1, 24
300   TOT(IHR,IPOLL) = TOT(IHR,IPOLL) + FACT(IHR) * POLL(IPOLL)

C     *** RETURN TO READ NEXT RECORD
      GO TO 200

C     *** COL,ROW HAVE CHANGED
400   CONTINUE

C     *** WRITE EMISSIONS TOTALS
      DO 500 IHR = 1, 24
500   WRITE(20,2000) COLOLD, ROWOLD, IHR, (TOT(IHR,IPOLL),IPOLL=1,NPOLL)
```

```
2000  FORMAT(2I4,I2,1P,60E10.3)

C     ***  UPDATE COLOLD, ROWOLD
      COLOLD - COL
      ROWOLD - ROW

C     ***  MULTIPLY EMISSIONS BY FACTORS AND INITIALIZE THE TOTALS
      DO 600 IPOLL - 1, NPOLL
      DO 600 IHR - 1, 24
600   TOT(IHR,IPOLL) - FACT(IHR) * POLL(IPOLL)

C     ***  RETURN TO READ NEXT RECORD
      GO TO 200

C     ***  END OF FILE REACHED
700   CONTINUE

C     ***  WRITE EMISSIONS TOTALS
      DO 800 IHR - 1, 24
800   WRITE(20,2000) COL, ROW, IHR, (TOT(IHR,IPOLL),IPOLL-1,NPOLL)

      RETURN
      END
      SUBROUTINE GRD20(NPOLL)

C     THIS ROUTINE PROCESSES GRIDDED AREA SOURCE EMISSIONS,
C     READING THE EMISSIONS FILE OUTPUT FROM SYNCSORT (TAM STEP 2),
C     MULTIPLYING THE ANNUAL EMISSIONS BY TEMPORAL FACTORS TO OBTAIN
C     HOURLY EMISSIONS FOR THE SCENARIO,
C     SUMMING EMISSIONS TO OBTAIN TOTALS FOR EACH GRID CELL, AND
C     WRITING THESE TEMPORALLY ALLOCATED EMISSIONS TO A FILE.
C     ARRAY DIMENSIONS.....

C     CODED 3/3/88 BY JOHN LANGSTAFF TO REDUCE PROCESSING TIME.

C     VARIABLES:
C     NPOLL  - THE NUMBER OF POLLUTANTS
C     COL,ROW,COLOLD,ROWOLD - COLUMN AND ROW NUMBERS OF A GRID CELL
C     FACT(24) - THE 24 HOURLY TEMPORAL ALLOCATION FACTORS
C     TOT(HOUR,SPECIES) - ARRAY OF HOURLY EMISSIONS TOTALS
C     POLL(NPOLL) - ARRAY OF ANNUAL EMISSIONS


      REAL POLL(20), FACT(24), TOT(24,20)
      INTEGER COL, ROW, COLOLD, ROWOLD

C     ***  READ THE FIRST RECORD
      READ(11,1000) COLOLD, ROWOLD, POLL, FACT
1000  FORMAT(2I4,61E10.3)

C     ***  MULTIPLY EMISSIONS BY FACTORS AND INITIALIZE THE TOTALS
      DO 100 IPOLL - 1, NPOLL
      DO 100 IHR - 1, 24
100   TOT(IHR,IPOLL) - FACT(IHR) * POLL(IPOLL)

C     ***  READ THE NEXT EMISSIONS RECORD
200   READ(11,1000,END-700) COL, ROW, POLL, FACT

C     ***  CHECK TO SEE WHETHER COL,ROW HAVE CHANGED
```

```
      IF(ROW.NE.ROWOLD) GO TO 400
      IF(COL.NE.COLOLD) GO TO 400

C     ***  COL,ROW HAVE NOT CHANGED
C     ***  MULTIPLY EMISSIONS BY FACTORS AND UPDATE THE TOTALS
      DO 300 IPOLL = 1, NPOLL
      DO 300 IHR = 1, 24
300   TOT(IHR,IPOLL) = TOT(IHR,IPOLL) + FACT(IHR) * POLL(IPOLL)

C     ***  RETURN TO READ NEXT RECORD
      GO TO 200

C     ***  COL,ROW HAVE CHANGED
400   CONTINUE

C     ***  WRITE EMISSIONS TOTALS
      DO 500 IHR = 1, 24
500   WRITE(20,2000) COLOLD, ROWOLD, IHR, (TOT(IHR,IPOLL),IPOLL=1,NPOLL)
2000  FORMAT(2I4,I2,1P,60E10.3)

C     ***  UPDATE COLOLD, ROWOLD
      COLOLD = COL
      ROWOLD = ROW

C     ***  MULTIPLY EMISSIONS BY FACTORS AND INITIALIZE THE TOTALS
      DO 600 IPOLL = 1, NPOLL
      DO 600 IHR = 1, 24
600   TOT(IHR,IPOLL) = FACT(IHR) * POLL(IPOLL)

C     ***  RETURN TO READ NEXT RECORD
      GO TO 200

C     ***  END OF FILE REACHED
700   CONTINUE

C     ***  WRITE EMISSIONS TOTALS
      DO 800 IHR = 1, 24
800   WRITE(20,2000) COL, ROW, IHR, (TOT(IHR,IPOLL),IPOLL=1,NPOLL)

      RETURN
      END
      SUBROUTINE GRD37(NPOLL)

C     THIS ROUTINE PROCESSES GRIDDED AREA SOURCE EMISSIONS,
C     READING THE EMISSIONS FILE OUTPUT FROM SYNCSORT (TAM STEP 2),
C     MULTIPLYING THE ANNUAL EMISSIONS BY TEMPORAL FACTORS TO OBTAIN
C     HOURLY EMISSIONS FOR THE SCENARIO,
C     SUMMING EMISSIONS TO OBTAIN TOTALS FOR EACH GRID CELL, AND
C     WRITING THESE TEMPORALLY ALLOCATED EMISSIONS TO A FILE.
C     ARRAY DIMENSIONS.....

C     CODED 3/3/88 BY JOHN LANGSTAFF TO REDUCE PROCESSING TIME.

C     VARIABLES:
C     NPOLL  - THE NUMBER OF POLLUTANTS
C     COL,ROW,COLOLD,ROWOLD - COLUMN AND ROW NUMBERS OF A GRID CELL
C     FACT(24) - THE 24 HOURLY TEMPORAL ALLOCATION FACTORS
C     TOT(HOUR,SPECIES) - ARRAY OF HOURLY EMISSIONS TOTALS
C     POLL(NPOLL) - ARRAY OF ANNUAL EMISSIONS
```

```
      REAL POLL(37), FACT(24), TOT(24,37)
      INTEGER COL, ROW, COLOLD, ROWOLD

C     ***  READ THE FIRST RECORD
      READ(11,1000) COLOLD, ROWOLD, POLL, FACT
1000  FORMAT(2I4,61E10.3)

C     ***  MULTIPLY EMISSIONS BY FACTORS AND INITIALIZE THE TOTALS
      DO 100 IPOLL - 1, NPOLL
      DO 100 IHR - 1, 24
100   TOT(IHR,IPOLL) - FACT(IHR) * POLL(IPOLL)

C     ***  READ THE NEXT EMISSIONS RECORD
200   READ(11,1000,END-700) COL, ROW, POLL, FACT

C     ***  CHECK TO SEE WHETHER COL,ROW HAVE CHANGED
      IF(ROW.NE.ROWOLD) GO TO 400
      IF(COL.NE.COLOLD) GO TO 400

C     ***  COL,ROW HAVE NOT CHANGED
C     ***  MULTIPLY EMISSIONS BY FACTORS AND UPDATE THE TOTALS
      DO 300 IPOLL - 1, NPOLL
      DO 300 IHR - 1, 24
300   TOT(IHR,IPOLL) - TOT(IHR,IPOLL) + FACT(IHR) * POLL(IPOLL)

C     ***  RETURN TO READ NEXT RECORD
      GO TO 200

C     ***  COL,ROW HAVE CHANGED
400   CONTINUE

C     ***  WRITE EMISSIONS TOTALS
      DO 500 IHR - 1, 24
500   WRITE(20,2000) COLOLD, ROWOLD, IHR, (TOT(IHR,IPOLL),IPOLL-1,NPOLL)
2000  FORMAT(2I4,I2,1P,60E10.3)

C     ***  UPDATE COLOLD, ROWOLD
      COLOLD - COL
      ROWOLD - ROW

C     ***  MULTIPLY EMISSIONS BY FACTORS AND INITIALIZE THE TOTALS
      DO 600 IPOLL - 1, NPOLL
      DO 600 IHR - 1, 24
600   TOT(IHR,IPOLL) - FACT(IHR) * POLL(IPOLL)

C     ***  RETURN TO READ NEXT RECORD
      GO TO 200

C     ***  END OF FILE REACHED
700   CONTINUE

C     ***  WRITE EMISSIONS TOTALS
      DO 800 IHR - 1, 24
800   WRITE(20,2000) COL, ROW, IHR, (TOT(IHR,IPOLL),IPOLL-1,NPOLL)

      RETURN
      END
      SUBROUTINE NONGRD(NPOLL)
C***********************************************************************
C
C     PROCESSES NON-GRIDDED EMISSIONS
C
C***********************************************************************
      INTEGER SCC,ST,CO,TSCC,TST,TCO
      LOGICAL EOF
      REAL POLL(100),FACT(24),TOT(24,100)

C    SET SCC, ST, AND CO - STARTUP ONLY
      READ(11,10) SCC,ST,CO
   10 FORMAT(I8,I2,I4)
      BACKSPACE 11

C    CLEAR TOTALS, TOT
   20 CONTINUE
      DO 30 IHR = 1, 24
      DO 30 IPOLL = 1, NPOLL
   30 TOT(IHR,IPOLL) = 0.0

   40 CONTINUE
C       READ NEXT RECORD
        EOF = .TRUE.
        READ(11,50,END=99) TSCC,TST,TCO,(POLL(J),J=1,NPOLL),
     &                        (FACT(J),J=1,24)
   50   FORMAT(I8,I2,I4,124E10.3)
        EOF = .FALSE.

        IF (TSCC.EQ.SCC .AND. TST.EQ.ST .AND. TCO.EQ.CO) THEN
C        MULTIPLY EMISSIONS BY FACTORS AND ACCUMULATE TOTALS
          DO 60 IHR = 1, 24
          DO 60 IPOLL = 1, NPOLL
   60     TOT(IHR,IPOLL) = TOT(IHR,IPOLL) + FACT(IHR)*POLL(IPOLL)
          GOTO 40

        ELSE
C        OUTPUT AND REINITIALIZE
   99     CONTINUE
          DO 70 IHR = 1, 24
            WRITE(20,80) SCC,ST,CO,IHR,(TOT(IHR,J),J=1,NPOLL)
   80       FORMAT(I8,I2,I4,I2,1P,100E10.3)
   70     CONTINUE
          IF (EOF) RETURN
          SCC = TSCC
          ST = TST
          CO = TCO
          BACKSPACE 11
          GOTO 20
        ENDIF

      END
```

```
OPTIONS MPRINT;
*-----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM:  TAM AREA SOURCE MODELER'S TAPE PREPROCESSOR
            (SAS COMPLEMENT TO FORTRAN MTPREP)

  LANGUAGE:  SAS (VERSION 5.16)

  PURPOSE:  TO READ EBCDIC OUTPUT FROM MTPREP.FORT INTO A SAS DATA SET

  VARIABLE LIST

NAME                                DESCRIPTION
========================================================================
NUMPOLL                 NUMBER OF POLLUTANTS IN EMISSIONS FILE
EMRES                   EMISSIONS RESOLUTION (GRIDDED OR NONGRIDDED)
GMT                     HOUR OF EMISSIONS (GREENWICH MEAN TIME)
COL                     GRID COLUMN
ROW                     GRID ROW
SCC                     SOURCE CLASSIFICATION CODE
STATE                   STATE CODE
COUNTY                  COUNTY CODE
TOT1-TOT&NUMPOLL        EMISSIONS TOTALS

  ERROR HANDLING:  INVALID VALUES IN CONTROL OPTIONS FILE WILL
                   HALT EXECUTION.

  METHOD:  READS AND CHECKS CONTROL OPTIONS FILE.  INPUTS TEMPORALLY
           RESOLVED EMISSIONS FILE TO SAS.
  PROGRAMMER:  ANDREW ACKERMAN, ALLIANCE TECH CORP, JUNE 1987

*-----------------------------------------------------------------------*

***** MACRO DEFINITION *****;

***** MACRO READSAS

***** READ EBCDIC EMISSIONS FILE INTO SAS
;
%MACRO READSAS;
%LET NUMPOLL = %EVAL(&NUMPOLL);
%LET EMRES = %SUBSTR(&EMRES,1,1);
%*;
DATA OUTFILE.DATA;
  INFILE INFILE;
  %IF &EMRES=G %THEN %LET EMID=%STR(COL 4. ROW 4.);
  %ELSE %LET EMID=%STR(SCC 8. STATE 2. COUNTY 4.);
  INPUT @1 &EMID GMT 2. (TOT1-TOT&NUMPOLL) (E10.);
%*;
%MEND READSAS;

***** END OF MACRO DEFINITION *****;

***** READ CONTROL OPTIONS FILE
;
DATA _NULL_;
```

```
  INFILE COF;
  INPUT @1 NUMPOLL 3. @5 EMRES $10.;

* CHECK FOR INVALID COF DATA;
  IF NUMPOLL < 1 THEN DO;
    PUT '*** FATAL: INVALID NUMBER OF POLLUTANTS' NUMPOLL-;
    ABORT;
    END;
  ELSE IF EMRES NE 'GRIDDED' AND EMRES NE 'NONGRIDDED' THEN DO;
    PUT '*** FATAL:  INVALID EMISSIONS RESOLUTION' EMRES-;
    ABORT;
    END;

* BRIEF DIAGNOSTIC REPORT (ECHO COF);
  FILE PRINT NOTITLES;
  PUT // @2 '*** MTPREP DIAGNOSTIC REPORT ***'//
         @2 '    NUMBER OF POLLUTANTS: ' NUMPOLL- /
         @2 '    EMISSIONS RESOLUTION: ' EMRES-;
*;
CALL SYMPUT('NUMPOLL',NUMPOLL);
CALL SYMPUT('EMRES',EMRES);
RUN;
%READSAS
```

APPENDIX E

SPECIATION MODULE

```
OPTIONS MPRINT DQUOTE;
*-----------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: SPECIATION MODULE (SM) - POINT SOURCES

  LANGUAGE: SAS (VERSION 5.08)

  PURPOSE: TO APPLY SPECIATION FACTORS TO THE EMISSION RECORDS
           OUTPUT FROM MDEM OR TAM

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME          ROUTINE              DESCRIPTION
===================================================================
TYPE           MAIN        CONTROL OPTIONS RECORD TYPE
SCE            MAIN        SOURCE TYPE OF EMISSION FILE
DETAIL         MAIN        LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
SASMEM         MAIN        SAS MEMBER NAME OF EMISSION FILE
RUN_ID         MAIN        RUN IDENTIFICATION HEADER
INDX1          MAIN        NUMBER OF TYPE 1 RECORDS
INDX2          MAIN        NUMBER OF TYPE 2 RECORDS
MAJCAT1-15     MAIN        SAROAD CODES OF POLLUTANT CATEGORIES TO BE
                           SPECIATED (NOT INCLUDING THC OR NOX)
NUM_SP1-15     MAIN        NUMBER OF SPECIES IN EACH POLLUTANT CATEGORY
                           (NOT INCLUDING THC OR NOX)
TOT_SP         MAIN        TOTAL NUMBER OF SPECIES (NOT INCLUDING
                           THC OR NOX)

  VARIABLE LIST: PSPLIT OUTPUT FILE

NAME          ROUTINE              DESCRIPTION
===================================================================
TYPE           MAIN        PSPLIT RECORD GENERAL TYPE (1 OR 2)
TYPES          MAIN        PSPLIT RECORD SPECIFIC TYPE (11,12,21, OR 22)
CAT1-32        MAIN        SAROAD CODE FOR THC POLLUTANT CATEGORY
CLASS1-32      MAIN        SAROAD CODE FOR THC SUBCLASSES
SF1-32         MAIN        SPECIATION FACTORS FOR EACH THC SUBCLASS
CAT33-34       MAIN        SAROAD CODE FOR NITROGEN OXIDES
CLASS33-34     MAIN        SPECIATION FACTORS FOR NOX SUBCLASSES (NO,NO2)
SF33-34        MAIN        SPECIATION FACTORS FOR EACH NOX SUBCLASS
SCC            MAIN        SCC CODE
STATE          MAIN        STATE CODE
COUNTY         MAIN        COUNTY CODE
PLANT_ID       MAIN        PLANT ID
POINT_ID       MAIN        POINT ID
HCHOWT         MAIN        WT PERCENT FORMALDEHYDE IN PROFILE

  VARIABLE LIST: SPECIATION FACTOR FILE

NAME          ROUTINE              DESCRIPTION
===================================================================
TYPE           SFFIN       SFF RECORD GENERAL TYPE (1 OR 2)
TYPES          SFFIN       SFF RECORD SPECIFIC TYPE (11,12,21, OR 22)
CAT35-ARRDEX   SFFIN       SAROAD CODE FOR POLLUTANT CATEGORIES
CLASS35-ARRDEX SFFIN       SAROAD CODES FOR SUBCLASSES
SF35-ARRDEX    SFFIN       SPECIATION FACTORS FOR EACH SUBCLASS
SCC            SFFIN       SCC CODE
```

```
STATE          SFFIN        STATE CODE
COUNTY         SFFIN        COUNTY CODE
PLANT_ID       SFFIN        PLANT ID
POINT_ID       SFFIN        POINT ID

  VARIABLE LIST: ADDITIONS TO EMISSION FILE

NAME          ROUTINE                DESCRIPTION
-----------------------------------------------------------------------
CAT1-ARRDEX   SORTMER       SAROAD CODE OF POLLUTANT CATEGORY
CLASS1-ARRDEX SORTMER       SAROAD CODE OF POLLUTANT SUBCLASS
SF1-ARRDEX    SORTMER       SPECIATION FACTOR OF POLLUTANT SUBCLASS
NUMSP         SORTMER       TOTAL NUMBER OF SPECIATION FACTORS
HCHOWT        SORTMER       WEIGHT PERCENT FORMALDEHYDE IN PROFILE

  VARIABLE LIST: GENERAL

NAME          ROUTINE                DESCRIPTION
-----------------------------------------------------------------------
TM             MAIN         SYSTEM TIME
DT             MAIN         SYSTEM DATE
ARRDEX        SFFIN         TOTAL ELEMENTS IN CAT/CLASS/SF ARRAYS
_N_           SFFIN         NUMBER OF DATA STEP ITERATIONS
_I_           SFFIN         ARRAY INDEX
A             SFFIN         INDEX FOR NUMBER OF CATS IN COF
B             SFFIN         INDEX OFFSET FOR SFF
C             SFFIN         INDEX FOR NUMBER OF SPECIES IN CAT B
IN           SORTMER        SAS DATA LIBRARY MEMBER NAME
IN1          SORTMER        MERGE VARIABLE
IN2          SORTMER        MERGE VARIABLE
REPO           MAIN         REPORT DETAIL LABEL
RUNCOL         MAIN         COLUMN REQUIRED TO CENTER RUN ID

  ERROR HANDLING:
     ERRORS IN THE CONTROL FILE WILL HALT PROGRAM EXECUTION.

  CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

  METHOD: SM INPUTS AND CHECKS THE CONTROL OPTIONS FILE.  THE PSPLIT
          OUTPUT FILE AND THE SPECIATION FACTOR FILE ARE INPUT AND
          MERGED THEN SPLIT INTO SPECIATION FACTOR FILES (SPEC) WITH
          DIFFERENT DEGREES OF SPECIFICITY. THE SFF'S ARE MERGED WITH
          THE EMISSION FILE AND A REPORT IS PRINTED.

  PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, AUGUST 1985

  MODIFIED:   LYSA LEBOWITZ, ALLIANCE TECHNOLOGIES CORPORATION
              SEPTEMBER 1987
              ROB WALTERS, ALLIANCE TECHNOLOGIES CORPORATION
              JANUARY 1988
*----------------------------------------------------------------------*
;
************************************************************************
*****          M A C R O   D E F I N I T I O N S                  *****
************************************************************************
;
*****   M A C R O   S F F I N

***** READS THE SPECIATION FACTOR FILE. PROVIDES VARIABLE NUMBER OF
```

```
      VARIABLES BASED ON NUMBER OF SPECIES IN SFF.
;
%MACRO SFFIN;
*;
*---- READ SFF (SAROADS/SPECIATION FACTORS FOR NON-THC/NOX SPECIES)
;
  %IF &TOT_SP>=1 %THEN %DO;
  %LET ARRDEX=%EVAL(&TOT_SP+34);
    DATA SFF; INFILE SFF;
      ARRAY CLASS CLASS35-CLASS&ARRDEX;
      ARRAY SF SF35-SF&ARRDEX;
      DROP TYPE TYPES;
      RETAIN CLASS35-CLASS&ARRDEX SF35-SF&ARRDEX;
*;
      INPUT @104 TYPE 1. @1 @;
*;
*---- TYPE 1 RECORD (HEADER - SAROAD CODES)
;
      IF TYPE=1 THEN DO;
         INPUT @ 104 TYPES 2. @1 @;
         IF TYPES=11 THEN DO;
            DO _I_=1 TO 10;
               INPUT CLASS 7. @;
            END;
         END;
         ELSE IF TYPES=12 THEN DO;
            DO _I_=11 TO &TOT_SP;
               INPUT CLASS 7. @;
            END;
         END;
         ELSE IF TYPES NE 11 AND TYPES NE 12 THEN DO;
            PUT '*** FATAL: BAD SFF HEADER RECORD ' TYPES=;
            ABORT;
         END;
         RETURN;
      END;
*;
*---- TYPE 2 RECORD (SPECIATION FACTORS)
;
      IF TYPE=2 THEN DO;
         INPUT @1 STATE 2. @3 COUNTY 4. @7 PLANT_ID $4.
               @11 POINT_ID $3. @14 SCC 8. @;
          INPUT @104 TYPES 2. @1 @;
          IF TYPES=21 THEN DO;
             INPUT @ 22 @;
             DO _I_=1 TO 10;
                INPUT SF 8.8 @;
             END;
          END;
          ELSE IF TYPES=22 THEN DO;
             INPUT @ 22 @;
             DO _I_=11 TO &TOT_SP;
                INPUT SF 8.8 @;
             END;
          OUTPUT;
          END;
          ELSE IF TYPES NE 21 AND TYPES NE 22 THEN DO;
            PUT '*** FATAL: BAD SFF SPECIATION RECORD ' TYPES=;
            ABORT;
         END;
      END;
      RETURN;
*;
*---- MERGE WITH COF AND ASSIGN POLLUTANT CATEGORIES
;
    DATA TWO(DROP=SCE DETAIL SASMEM RUN_ID INDX1 INDX2 NUMSP TOT_SP
      NUM_SP1-NUM_SP15 MAJCAT1-MAJCAT15);
      IF _N_=1 THEN SET ONE;
      SET SFF;
      ARRAY CAT CAT35-CAT&ARRDEX;
      %LET C=%EVAL(1);
      %DO A=1 %TO &INDX2;
        %LET B=%EVAL(&A+2);
        DO _I_=&C TO NUM_SP&B+&C-1;
          CAT=MAJCAT&B;
        END;
        %LET C=NUM_SP&B+&C;
      %END;
*;
*---- SORT SPECIATION FACTOR FILE
;
    PROC SORT DATA=TWO; BY SCC;
*;
  %END;
%MEND SFFIN;
*
;
*****   M A C R O   P S P M E R

***** MERGE PSPLIT FILE WITH SFF IF SFF EXISTS
;
%MACRO PSPMER;
  DATA SPEC5;
    %IF &TOT_SP>=1 %THEN %DO;
      MERGE THREE TWO;
      BY SCC;
    %END;
    %ELSE %DO;
      SET THREE;
    %END;
    DROP PLANT_ID POINT_ID;
%MEND PSPMER;
*
;
*****   M A C R O   S O R T M E R

***** MERGE EMISSION FILE WITH SPECIES FILE.
;
%MACRO SORTMER;
*;
%LET NUMSP=%EVAL(&NUMSP);
  DATA OUTFILE1.&SASMEM OUTFILE2.NOSPEC(DROP=NUMSP HCHOWT CAT1-CAT&NUMSP
  CLASS1-CLASS&NUMSP SF1-SF&NUMSP);
  MERGE SPEC5(IN=IN2) INFILE.&SASMEM(IN=IN1);
    BY SCC;
    NUMSP=&NUMSP;
    IF IN1 AND IN2 THEN OUTPUT OUTFILE1.&SASMEM;
    ELSE IF IN1 THEN OUTPUT OUTFILE2.NOSPEC;
```

```
*;
%MEND SORTMER;
*;
*****   M A C R O   D E T A I L

***** PRINT OUT DETAILED REPORT
;
%MACRO DETAIL;
*;
*---- PRINT NOSPEC (NO MATCH IN SPECIATION FILE)
;
PROC PRINT DATA=OUTFILE2.NOSPEC;
  VAR SCC STATE COUNTY
    PLANT_ID POINT_ID;
TITLE 'EMISSION RECORDS WITH NO SPECIATION PROFILE';
FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
%*;
%*--- CHECK COF FOR DETAIL
;
  %LET NUMSP=%EVAL(&NUMSP);
  %IF &DETAIL=D %THEN %DO;
    PROC PRINT DATA=OUTFILE1.&SASMEM(OBS=50);
    ID SCC STATE COUNTY PLANT_ID POINT_ID;
    VAR NUMSP HCHOWT CAT1-CAT&NUMSP CLASS1-CLASS&NUMSP SF1-SF&NUMSP;
    FORMAT SCC Z8. STATE Z2. COUNTY Z4. NUMSP 3. HCHOWT 5.4;
    TITLE 'EMPLOYED SPECIATION FACTORS - FIRST 50 OBSERVATIONS';
    TITLE2 '(HYDROCARBON FACTORS IN MOLES/KG)';
  %END;
*;
%MEND DETAIL;
*;
**************************************************************************
*****          E N D   M A C R O   D E F I N I T I O N S           *****
**************************************************************************
;
********************
* MAIN PROGRAM: SM *
********************

***** THIS PROGRAM WILL:
                1. READ THE CONTROL OPTIONS FILE
                2. READ THE SPECIATION FACTOR FILE
                3. READ THE PSPLIT OUTPUT FILE
                4. MERGE AND SPLIT 2. AND 3.
                5. MERGE WITH EMISSION FILE
                6. PRODUCE A DIAGNOSTIC REPORT
;
***** READ THE CONTROL FILE
;
*---- OPEN FILES AND DEFINE ARRAYS
;
DATA ONE(DROP=TYPE); INFILE COF EOF=WRITE;
  ARRAY MAJCAT MAJCAT1-MAJCAT15;
  ARRAY NUM_SP NUM_SP1-NUM_SP15;
  RETAIN SCE DETAIL SASMEM MAJCAT1-MAJCAT15 NUM_SP1-NUM_SP15
       TOT_SP RUN_ID INDX2;
  INPUT @1 TYPE 1. @;
*;
*---- INVALID CONTROL RECORD
```

```
;
 IF TYPE NE 1 AND TYPE NE 2 THEN DO;
   PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
   ABORT;
 END;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION)
;
 IF TYPE=1 THEN DO;
*;
*     CHECK FOR TOO MANY TYPE 1 RECORDS.
;
  INDX1+1;
  IF INDX1>1 THEN DO;
   PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN CONTROL FILE';
   ABORT;
  END;
*;
*     INPUT AND CHECK DATA
;
  INPUT @3 SCE $2. @6 DETAIL $1. @8 SASMEM $8. @17 RUN_ID $56.;
  IF SCE NE 'PS' THEN DO;
   PUT '*** FATAL: INVALID SOURCE TYPE ' SCE=;
   ABORT;
  END;
  IF DETAIL NE 'D' AND DETAIL NE 'S' THEN DO;
   PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT ' DETAIL=;
   ABORT;
  END;
  INDX2=0;
  RETURN;
 END;
*;
*---- TYPE 2 CONTROL RECORD (SPECIATION FILE FORMAT).
;
 IF TYPE=2 THEN DO;
*;
*     CHECK FOR TOO MANY TYPE 2 RECORDS
;
  INDX2+1;
  IF INDX2>13 THEN DO;
   PUT '*** FATAL: TOO MANY POLLUTANT CLASSES SPECIFIED';
   ABORT;
  END;
*;
*     INPUT AND CHECK DATA
;
  IF INDX2=1 THEN _I_=3;
  INPUT @3 MAJCAT 5. @9 NUM_SP 2.;
  IF NUM_SP>32 THEN DO;
   PUT '*** FATAL: GREATER THAN 32 SUBCLASSES SPECIFIED';
   ABORT;
  END;
  TOT_SP+NUM_SP;
  _I_+1;
  RETURN;
 END;
*;
*---- BEFORE OUTPUT, SET VALUES OF PSPLIT FILE (THC AND NOX)
```

```
;
WRITE: MAJCAT1=43101;
       MAJCAT2=42603;
       NUM_SP1=32;
       NUM_SP2=2;
       IF TOT_SP=. THEN TOT_SP=0;
       NUMSP=TOT_SP+34;
       OUTPUT;
*;
***** INPUT SPECIATION FACTOR FILE
;
*---- CREATE MACRO VARIABLES AND CALL INPUT MACRO
;
       CALL SYMPUT('TOT_SP',TOT_SP);
       CALL SYMPUT('INDX2',INDX2);
       RUN;
       %SFFIN
*;
***** INPUT PSPLIT OUTPUT FILE
;
DATA THREE(DROP=TYPE TYPES); INFILE PSPLIT;
  ARRAY CLASS CLASS1-CLASS32;
  ARRAY CAT CAT1-CAT32;
  ARRAY SF SF1-SF32;
  RETAIN CAT1-CAT34 CLASS1-CLASS34 SF1-SF34 HCHOWT;
*;
*    INPUT RECORD TYPE
;
  INPUT @114 TYPE 1. @1 @;
*;
*     BAD PSPLIT RECORD
;
  IF TYPE NE 1 AND TYPE NE 2 THEN DO;
     PUT '*** FATAL: BAD PSPLIT RECORD' TYPE=;
     ABORT;
  END;
*;
*----     TYPE 1 RECORD (HEADER)
;
  IF TYPE=1 THEN DO;
     INPUT @114 TYPES 2. @1 @;
     IF TYPES = 11 THEN DO;
        DO _I_=1 TO 16;
           CAT=43101;
           INPUT CLASS 5. @;
        END;
     END;
     ELSE IF TYPES = 12 THEN DO;
        DO _I_=17 TO 32;
           CAT=43101;
           INPUT CLASS 5. @;
        END;
     END;
     ELSE IF TYPES NE 11 AND TYPES NE 12 THEN DO;
        PUT '*** FATAL BAD PSPLIT HEADER RECORD' TYPES=;
        ABORT;
     END;
     CAT33=42603;
     CAT34=42603;
```

```
        CLASS33-42601;
        CLASS34-42602;
        RETURN;
     END;
   *;
   *----     TYPE 2 RECORD (SPECIATION FACTORS)
   ;
     IF TYPE-2 THEN DO;
        INPUT @1 STATE 2. @3 COUNTY 4. @7 PLANT_ID $4. @11 POINT_ID $3.
              @14 SCC 8. @;
        INPUT @114 TYPES 2. @1 @;
        IF TYPES - 21 THEN DO;
           INPUT @ 22 @;
           DO _I_-1 TO 16;
              INPUT SF 5.3 @;
           END;
           INPUT HCHOWT 4.4 SF33 4.3 SF34 4.3;
        END;
        ELSE IF TYPES - 22 THEN DO;
           INPUT @22 @;
           DO _I_-17 TO 32;
              INPUT SF 5.3 @;
           END;
           OUTPUT;
        END;
        ELSE IF TYPES NE 21 AND TYPES NE 22 THEN DO;
           PUT '*** FATAL BAD PSPLIT SPECIATION RECORD' TYPES-;
           ABORT;
        END;
     END;
     RETURN;
   *;
   *---- SORT PSPLIT OUTPUT
   ;
   PROC SORT DATA-THREE; BY SCC;
   *;
   ***** MERGE PSPLIT OUTPUT WITH SFF.
   ;
   %PSPMER
   *;
   ***** MERGE COMPLETE SPECIATION FACTORS WITH EMISSION FILE
   ;
   *---- CALL A MACRO TO SORT EMISSION FILE THEN MERGE
   ;
   DATA _NULL_;SET ONE;
     CALL SYMPUT('NUMSP',NUMSP);
     CALL SYMPUT('SASMEM',SASMEM);
     RUN;
     %SORTMER
   *;
   ***** WRITE DIAGNOSTIC REPORT
   ;
   *---- DEFINE FILE ASSIGN ARRAY AND INITIALIZE VARIABLES
   ;
   DATA _NULL_;SET ONE;
     ARRAY MAJCAT MAJCAT1-MAJCAT15;
     ARRAY NUM_SP NUM_SP1-NUM_SP15;
     FILE PRINT NOTITLES;
     IF DETAIL-'S' THEN REPO-' SUMMARY'; ELSE REPO-'DETAILED';
   DT=DATE();TM=TIME();
   RUNCOL=66-LENGTH(RUN_ID)/2;
 *;
 *---- PRINT HEADER
 ;
   PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
       @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
       @110 'SPECIATION MODULE (SM)'//@2 'DIAGNOSTIC REPORT'
       @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
       'CONTROL FILE LISTING' @77 55*'-'//;
 *;
 *---- PRINT TYPE 1 RECORD
 ;
   PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SCE: ' SCE ' DETAIL: '
       DETAIL ' SAS FILE: ' SASMEM 'RUN ID: ' RUN_ID///;
 *;
 *---- PRINT TYPE 2 RECORDS
 ;
 IF INDX2>0 THEN DO;
   PUT @2 'SPECIATION FACTOR FILE DEFINITION RECORDS:'//
       @51 '             MAJOR'/
       @51 '           POLLUTANT    # OF'/
       @51 'RECORD #     SAROAD  SUBCLASSES'/
       @51 '-----------------------------'/;
   DO _I_=3 TO INDX2+2;
   NUMB=_I_-2;
     PUT @53 NUMB 2. @63 MAJCAT 5. @75 NUM_SP 2./;
   END;
   PUT @51 '-----------------------------'/_PAGE_;
 END;
 *;
 *---- PROCESS DETAILED REPORT
 ;
 CALL SYMPUT('DETAIL',DETAIL);
 CALL SYMPUT('SASMEM',SASMEM);
 CALL SYMPUT('NUMSP',NUMSP);
 RUN;
 %DETAIL
 *;
 ********************
 * END MAIN PROGRAM *
 ********************
 ;
 /*
```

```
OPTIONS MPRINT DQUOTE;
*------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: SPECIATION MODULE (SM) - AREA SOURCES

  LANGUAGE: SAS (VERSION 5.08)

  PURPOSE: TO APPLY SPECIATION FACTORS TO THE EMISSION RECORDS
           OUTPUT FROM MDEM AND CREATE SPECIATED EMISSIONS

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME          ROUTINE             DESCRIPTION
------------------------------------------------------------------
TYPE           MAIN         CONTROL OPTIONS RECORD TYPE
SOURCE         MAIN         EMISSION FILE SOURCE TYPE (AS)
DETAIL         MAIN         LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
SASMEM         MAIN         SAS MEMBER NAME OF EMISSION FILE
SFFLG          MAIN         FLAG DENOTING PRESENCE OF PSPLIT/SFF FILES
RUN_ID         MAIN         RUN IDENTIFICATION HEADER
INDX1          MAIN         NUMBER OF TYPE 1 RECORDS
INDX2          MAIN         NUMBER OF TYPE 2 RECORDS
MAJCAT1-15     MAIN         VARIABLE NAMES OF MAJOR POLLUTANTS TO BE
                            SPECIATED
NUM_SP1-15     MAIN         NUMBER OF SPECIES IN EACH POLLUTANT CATEGORY
NUMSP          MAIN         TOTAL NUMBER OF SPECIES
PSPLIT         MAIN         NUMBER OF SPECIES IN PSPLIT OUTPUT FILE
SFF            MAIN         NUMBER OF SPECIES IN SFF FILE

  VARIABLE LIST: PSPLIT OUTPUT FILE

NAME          ROUTINE             DESCRIPTION
------------------------------------------------------------------
TYPE           PSPIN        PSPLIT RECORD GENERAL TYPE (1 OR 2)
TYPES          PSPIN        PSPLIT RECORD SPECIFIC TYPE (11,12,21 OR 22)
CLASS          PSPIN        SAROAD CODE FOR THC OR NOX SUBCLASSES
TSF            PSPIN        SPECIATION FACTOR FOR EACH THC OR NOX SUBCLASS
SCC            PSPIN        SCC CODE
STATE          PSPIN        STATE CODE
COUNTY         PSPIN        COUNTY CODE
HCHOWT         PSPIN        HC ADJUSTMENT FOR ALDEHYDE AND METHANE

  VARIABLE LIST: SPECIATION FACTOR FILE

NAME          ROUTINE             DESCRIPTION
------------------------------------------------------------------
TYPE           SFFIN        SFF RECORD GENERAL TYPE (1 OR 2)
TYPES          SFFIN        SFF RECORD SPECIFIC TYPE (11,12,21 OR 22)
CLASS          SFFIN        SAROAD CODES FOR SUBCLASSES
TSF            SFFIN        SPECIATION FACTORS FOR EACH SUBCLASS
SCC            SFFIN        SCC CODE
STATE          SFFIN        STATE CODE
COUNTY         SFFIN        COUNTY CODE

  VARIABLE LIST: ADDITIONS TO EMISSION FILE

NAME          ROUTINE             DESCRIPTION
```

```
==================================================================
SE          SORTMER      SPECIATED EMISSIONS (TONS/YR OR MOLES/YR)

  VARIABLE LIST: GENERAL

NAME        ROUTINE                 DESCRIPTION
==================================================================
TM            MAIN       SYSTEM TIME
DT            MAIN       SYSTEM DATE
_N_           SFFIN      NUMBER OF DATA STEP ITERATIONS
_I_           SFFIN      ARRAY INDEX
IN          SORTMER      SAS DATA LIBRARY MEMBER NAME
IN1         SORTMER      MERGE VARIABLE
IN2         SORTMER      MERGE VARIABLE
REPO          MAIN       REPORT DETAIL LABEL
RUNCOL        MAIN       COLUMN REQUIRED TO CENTER RUN ID
ENDSFF      SORTMER      NUMBER OF LAST SPECIE
FIRST       SORTMER      SF NUMBER OF FIRST SPECIE WITHIN A MAJOR
                         POLLUTANT CATEGORY
LAST        SORTMER      SF NUMBER OF LAST SPECIE WITHIN A MAJOR
                         POLLUTANT CATEGORY
FACTOR      SORTMER      CONVERSION FOR THC EMISSIONS TO KG.
K           SORTMER      ARRAY COUNTER
ORDER        PSPMER      CODE FOR SPECIE ORDER IN EMISSION FILE
NO            SFFIN      SF NUMBER FOR NO
NO2           SFFIN      SF NUMBER FOR NO2
SFF            MAIN      NUMBER OF SPECIES IN SFF FILE
PSPLIT         MAIN      NUMBER OF SPECIES IN PSPLIT FILE
THCNUM        SFFIN      NUMBER OF THC SPECIES

  ERROR HANDLING:
     ERRORS IN THE CONTROL FILE WILL HALT PROGRAM EXECUTION,
     AS WILL INVALID RECORD TYPE CODES IN THE PSPLIT AND SFF
     FILES.

  CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

  METHOD: SM INPUTS AND CHECKS THE CONTROL OPTIONS FILE.  THE
          FILES CONTAINING SPECIATION FACTORS ARE INPUT AND MERGED
          AS SPECIFIED IN THE COF.  THE FACTORS ARE THEN MERGED WITH
          THE EMISSION FILE, MULTIPLIED BY THE MAJOR POLLUTANT
          CATEGORY, AND OUTPUT.  A SUMMARY, EMISSION OR DETAILED
          REPORT IS PRINTED.

  PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, AUGUST 1985

  UPDATED:    DON NEAL, JULY 1986

  MODIFIED:   LYSA LEBOWITZ, ALLIANCE TECHNOLOGIES CORPORATION,
              SEPTEMBER 1987
              ROBERT WALTERS, ALLIANCE TECHNOLOGIES
              FEBRUARY 1988

*----------------------------------------------------------------*
;
******************************************************************
*****           M A C R O   D E F I N I T I O N S           *****
******************************************************************
```

```
;
*****  M A C R O   P S P I N

***** READS THE PSPLIT OUTPUT FILE IF INSTRUCTED
***** (FIRST ELEMENT OF SFFLG - 'Y')
;
%MACRO PSPIN;
%*;
%*---- CALCULATE SPECIES COUNTERS;
%*;
  %LET PSPLIT-%EVAL(&PSPLIT);
  %LET NO-%EVAL(&PSPLIT-1);
  %LET NO2-%EVAL(&PSPLIT);
  %LET THCNUM-%EVAL(&PSPLIT-2);
%*;
  %IF &SFFLG-YY OR &SFFLG-YN %THEN %DO;
%*;
    DATA PSPLIT(DROP-TYPE TYPES); INFILE PSPLIT;
       ARRAY CLASS CLASS1-CLASS&PSPLIT;
       ARRAY TSF TSF1-TSF&PSPLIT;
       RETAIN CLASS1-CLASS&PSPLIT TSF1-TSF&PSPLIT HCHOWT;
%*;
%*    INPUT RECORD TYPE
;
       INPUT @114 TYPE 1. @1 @;
%*;
%*    BAD PSPLIT RECORD (INVALID RECORD TYPE)
;
       IF TYPE NE 1 AND TYPE NE 2 THEN DO;
          PUT '*** FATAL: BAD PSPLIT RECORD ' TYPE-;
          ABORT;
       END;
%*;
%*    TYPE 1 RECORD (HEADER)
;
       IF TYPE-1 THEN DO;
%*;
%*--- CHOICE OF LOOP IS DEPENDENT ON &THCNUM;
%*;
          INPUT @114 TYPES 2. @1 @;
          IF TYPES NE 11 AND TYPES NE 12 THEN DO;
             PUT '*** FATAL: BAD PSPLIT HEADER RECORD ' TYPES=;
             ABORT;
          END;
          %IF &THCNUM <- 16 %THEN %DO;
             IF TYPES - 11 THEN DO;
                DO _I_-1 TO &THCNUM;
                   INPUT CLASS 5. @;
                END;
                INPUT;
                INPUT;
             END;
          %END;
          %ELSE %DO;
             IF TYPES - 11 THEN DO;
                DO _I_-1 TO 16;
                   INPUT CLASS 5. @;
                END;
             END;
             ELSE IF TYPES = 12 THEN DO;
                DO _I_=17 TO &THCNUM;
                   INPUT CLASS 5. @;
                END;
                INPUT;
             END;
          %END;
%*;
%*---- NOX SPECIES;
%*;
          CLASS&NO=42601;
          CLASS&NO2=42602;
%*;
          RETURN;
       END /* TYPE 1 */;
%*;
%*   TYPE 2 RECORD (SPECIATION FACTORS)
;
       IF TYPE=2 THEN DO;
          INPUT @1 STATE 2. @3 COUNTY 4. @14 SCC 8. @;
%*;
%*--- CHOICE OF LOOP IS DEPENDENT ON &THCNUM;
%*;
          INPUT @114 TYPES 2. @1 @;
          IF TYPES NE 21 AND TYPES NE 22 THEN DO;
             PUT '*** FATAL: BAD PSPLIT SPECIATION RECORD ' TYPES=;
             ABORT;
          END;
          %IF &THCNUM <= 16 %THEN %DO;
             IF TYPES = 21 THEN DO;
                INPUT @22 @;
                DO _I_=1 TO &THCNUM;
                   INPUT TSF 5.3 @;
                END;
                INPUT @102 HCHOWT 4.4 TSF&NO 4.3 TSF&NO2 4.3;
                INPUT;
             END;
          %END;
          %ELSE %DO;
             IF TYPES = 21 THEN DO;
                INPUT @22 @;
                DO _I_=1 TO 16;
                   INPUT TSF 5.3 @;
                END;
                INPUT @102 HCHOWT 4.4 TSF&NO 4.3 TSF&NO2 4.3;
             END;
             ELSE IF TYPES = 22 THEN DO;
                INPUT @22 @;
                DO _I_=17 TO &THCNUM;
                   INPUT TSF 5.3 @;
                END;
                OUTPUT;
             END;
          %END;
       END /* TYPE 2 */;
       RETURN;
%*;
%*---- SORT PSPLIT OUTPUT
;
```

```
    PROC SORT DATA=PSPLIT; BY SCC;
%*;
  %END;
%*;
%MEND PSPIN;
;
*;
*****  M A C R O   S F F I N

***** READS THE SPECIATION FACTOR FILE (SFF) IF INSTRUCTED
***** (SECOND ELEMENT OF SFFLG = 'Y')
;
%MACRO SFFIN;
%*;
%*---- CALCULATE SPECIES COUNTERS;
%*;
  %IF &SFF=. %THEN %LET SFF=%EVAL(0);
  %LET BEGSFF=%EVAL(&PSPLIT+1);
  %LET ENDSFF=%EVAL(&PSPLIT+&SFF);
  %IF &SFFLG=YY OR &SFFLG=NY %THEN %DO;
%*;
    DATA SFF(DROP=TYPE TYPES); INFILE SFF;
      ARRAY CLASS CLASS&BEGSFF-CLASS&ENDSFF;
      ARRAY TSF TSF&BEGSFF-TSF&ENDSFF;
      RETAIN CLASS&BEGSFF-CLASS&ENDSFF TSF&BEGSFF-TSF&ENDSFF;
%*;
%*    INPUT RECORD TYPE
;
       INPUT @104 TYPE 1. @1 @;
%*;
%*    BAD SFF RECORD (INVALID RECORD TYPE)
;
       IF TYPE NE 1 AND TYPE NE 2 THEN DO;
          PUT '*** FATAL: BAD SFF RECORD ' TYPE=;
          ABORT;
       END;
%*;
%*    TYPE 1 RECORD (HEADER)
;
       IF TYPE=1 THEN DO;
%*;
%*--- CHOICE OF LOOP IS DEPENDENT ON &SFF;
%*;
          INPUT @104 TYPES 2. @1 @;
          IF TYPES NE 11 AND TYPES NE 12 THEN DO;
             PUT '*** FATAL: BAD SFF HEADER RECORD ' TYPES=;
             ABORT;
          END;
          %IF &SFF <= 10 %THEN %DO;
             IF TYPES = 11 THEN DO;
                DO _I_=1 TO &SFF;
                   INPUT CLASS 7. @;
                END;
                INPUT;
                INPUT;
             END;
          %END;
          %ELSE %DO;
             IF TYPES = 11 THEN DO;
```

```
           DO _I_=1 TO 10;
              INPUT CLASS 7. @;
           END;
         END;
         ELSE IF TYPES = 12 THEN DO;
           DO _I_=11 TO &SFF;
              INPUT CLASS 7. @;
           END;
           INPUT;
         END;
       %END;
%*;
       RETURN;
     END /* TYPE 1 */;
%*;
%*   TYPE 2 RECORD (SPECIATION FACTORS)
;
     IF TYPE=2 THEN DO;
       INPUT @1 STATE 2. @3 COUNTY 4. @14 SCC 8. @;
%*;
%*--- CHOICE OF LOOP IS DEPENDENT ON &SFF;
%*;
       INPUT @104 TYPES 2. @1 @;
       IF TYPES NE 21 AND TYPES NE 22 THEN DO;
         PUT '*** FATAL: BAD SFF SPECIATION RECORD ' TYPES=;
         ABORT;
       END;
       %IF &SFF <= 10 %THEN %DO;
         IF TYPES = 21 THEN DO;
           INPUT @22 @;
           DO _I_=1 TO &SFF;
              INPUT TSF 8.8 @;
           END;
           INPUT;
           INPUT;
         END;
       %END;
       %ELSE %DO;
         IF TYPES = 21 THEN DO;
           INPUT @22 @;
           DO _I_=1 TO 10;
              INPUT TSF 8.8 @;
           END;
         END;
         ELSE IF TYPES = 22 THEN DO;
           INPUT @22 @;
           DO _I_=11 TO &SFF;
              INPUT TSF 8.8 @;
           END;
           OUTPUT;
         END;
       %END;
     END /* TYPE 2 */;
     RETURN;
%*;
%*---- SORT SFF OUTPUT
;
   PROC SORT DATA=SFF; BY SCC;
%*;
```

```
  %END;
%*;
%MEND SFFIN;
;
*;
*****  M A C R O   P S P M E R

*****  MERGE PSPLIT FILE WITH SFF (IF BOTH EXIST) AND PLACE CLASS
       SAROAD CODES INFO A FILE FOR THE REPORT.
;
%MACRO PSPMER;
%*;
  %LET START-%EVAL(&START);
  %LET FINISH-%EVAL(&FINISH);
  DATA SPECIES(KEEP-SCC TSF&START-TSF&FINISH)
       CLASSES(KEEP-CLASS ORDER);
  %IF &SFFLG - YY %THEN %DO;
     MERGE PSPLIT(IN-IN1) SFF;
     BY SCC;
     IF IN1;
  %END;
  %ELSE %IF &SFFLG - YN %THEN %DO;
     SET PSPLIT;
  %END;
  %ELSE %IF &SFFLG - NY %THEN %DO;
     SET SFF;
  %END;
  ARRAY SFCLASS CLASS&START-CLASS&FINISH;
%*;
%*---- IF FIRST PASS, CREATE CLASS DATA;
%*;
  IF _N_-1 THEN DO;
     ORDER-&START-1;
     DO OVER SFCLASS;
        ORDER+1;
        CLASS-SFCLASS;
        OUTPUT CLASSES;
     END;
  END;
%*;
%*---- OUTPUT MERGED SPECIATION RECORDS;
%*;
  OUTPUT SPECIES;
%*;
%MEND PSPMER;
;
*;
*****  M A C R O   T I M E Z O N E

*****  APPLY TIMEZONE DATA TO EMISSION FILE
;
%MACRO TIMEZONE;
%*;
%*---- INPUT AND SORT THE TIMEZONE FILE;
%*;
  DATA TIMEZONE; INFILE TZF;
    INPUT @1 STATE 2. COUNTY 4. ZONE 1. DAYLITE 1.;
%*;
%*     ADJUST TO GMT;
```

```
%*;
    ZONE-ZONE+4;
%*;
  PROC SORT DATA-TIMEZONE;
    BY STATE COUNTY;
%*;
%*---- SORT EMISSION FILE;
%*;
  PROC SORT DATA-INFILE.&SASMEM OUT-SORTOUT;
    BY STATE COUNTY;
%*;
%*---- MERGE TZF WITH EMISSIONS;
%*;
  DATA TZFOUT ORPHAN.NOTIME;
    MERGE SORTOUT(IN-INA) TIMEZONE;
    BY STATE COUNTY;
    IF INA;
    IF ZONE-. THEN OUTPUT ORPHAN.NOTIME;
    ELSE OUTPUT TZFOUT;
%*;
%*---- RESORT EMISSIONS TO PREPARE FOR SF MERGE;
%*;
  PROC SORT DATA-TZFOUT;
    BY SCC STATE COUNTY;
%*;
%MEND TIMEZONE;
;
*;
*****  M A C R O   S O R T M E R

*****  MERGE EMISSION FILE WITH SPECIES FILE. MULTIPLY FACTORS BY
       ANNUAL POLLUTANTS. OUTPUT RECORDS WITHOUT SPECIATION FACTORS
       TO ORPHAN FILE.
;
%MACRO SORTMER;
%*;
%*---- CREATE MACRO VARIABLES FOR MAJOR POLLUTANT NAMES AND NUMBERS;
%*;
  DATA _NULL_;SET ONE;
    %LET INDX2-%EVAL(&INDX2);
    %LET START-%EVAL(&START);
    %LET FINISH-%EVAL(&FINISH);
    %DO K-1 %TO &INDX2;
       CALL SYMPUT("MAJCAT&K",MAJCAT&K);
       CALL SYMPUT("NUM_SP&K",NUM_SP&K);
    %END;
    RUN;
%*;
%*---- PERFORM MERGE;
%*;
  DATA SMOUT.&SASMEM(DROP-TSF&START-TSF&FINISH)
       ORPHAN.NOSPEC(DROP-SE&START-SE&FINISH TSF&START-TSF&FINISH);
  MERGE SPECIES(IN-IN2) TZFOUT(IN-IN1);
    BY SCC;
    ARRAY SE SE&START-SE&FINISH;
    ARRAY TSF TSF&START-TSF&FINISH;
%*;
%*---- IF EMISSIONS AND SPECIES PRESENT, MULTIPLY EMISSIONS AND OUTPUT.
%*;
```

```
    IF IN1 AND IN2 THEN DO;
%*;
%*---- SELECT FIRST AND LAST MAJCAT BASED ON PSP/SFF FLAGS;
%*;
       %IF &SFFLG-YY OR &SFFLG-YN %THEN %LET X-%EVAL(1);
          %ELSE %LET X-%EVAL(3);
       %IF &SFFLG-YY OR &SFFLG-NY %THEN %LET Y-%EVAL(&INDX2);
          %ELSE %LET Y-%EVAL(2);
%*;
%*---- REPEAT FOR EACH MAJCAT (IF FIRST MAJ_CAT, CONVERT TONS TO KG);
%*;
       %LET FIRST-%EVAL(1);
       %DO K-&X %TO &Y;
          %IF &K-1 %THEN %LET FACTOR-907.18474;
          %ELSE %LET FACTOR-1;
          %LET LAST-%EVAL(&FIRST+&&NUM_SP&K.-1);
          DO _I_-&FIRST TO &LAST;
             SE-TSF*&&MAJCAT&K*&FACTOR;
          END;
          %LET FIRST-%EVAL(&LAST+1);
       %END;
%*;
       OUTPUT SMOUT.&SASMEM;
    END;
%*;
%*---- IF NO SPECIES ARE MERGED TO EMISSIONS RECORD, OUTPUT TO ORPHAN;
%*;
    ELSE IF IN1 THEN DO;
       OUTPUT ORPHAN.NOSPEC;
    END;
%*;
%MEND SORTMER;
*;
*;
*****  M A C R O   D E T A I L

*****  PRINT OUT DETAILED REPORT
;
%MACRO DETAIL;
%*;
%*---- PRINT RECORDS WITHOUT NO TIMEZONE DATA;
%*;
  PROC PRINT DATA-ORPHAN.NOTIME;
    VAR SCC STATE COUNTY;
    TITLE 'EMISSION RECORDS WITH NO TIME ZONE DATA';
%*;
%*---- PRINT NOSPEC (NO MATCH IN SPECIATION FILE)
;
  PROC PRINT DATA-ORPHAN.NOSPEC;
    VAR SCC STATE COUNTY;
    TITLE 'EMISSION RECORDS WITH NO SPECIATION PROFILE';
    FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
%*;
%*---- PRODUCE SUMS IF REQUESTED;
%*;
  %LET START-%EVAL(&START);
  %LET FINISH-%EVAL(&FINISH);
  %IF &DETAIL-T OR &DETAIL-D %THEN %DO;
    PROC MEANS MAXDEC-0 SUM DATA-SMOUT.&SASMEM;
    VAR SE&START-SE&FINISH;
    TITLE 'ANNUAL TOTALS OF SPECIATED EMISSIONS';
  %END;
%*;
%*--- CHECK COF FOR DETAIL
;
  %IF &DETAIL=D %THEN %DO;
    PROC PRINT DATA=SMOUT.&SASMEM(OBS=200);
    ID SCC STATE COUNTY;
    VAR SE&START-SE&FINISH;
    FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
    TITLE 'APPLIED SPECIATION FACTORS';
    TITLE2 '(FIRST 200 OBSERVATIONS)';
  %END;
%*;
%MEND DETAIL;
*;
************************************************************************
*****      E N D   M A C R O   D E F I N I T I O N S                *****
************************************************************************
;
********************
* MAIN PROGRAM: SM *
********************

***** THIS PROGRAM WILL:
                1. READ THE CONTROL OPTIONS FILE
                2. READ THE PSPLIT OUTPUT FILE (IF SO INSTRUCTED)
                3. READ THE SFF FILE (IF SO INSTRUCTED)
                4. MERGE 2. AND 3.
                5. SORT EMISSION FILE AND APPLY TIMEZONE DATA
                6. MERGE EMISSION FILE WITH SPECIATION FILE
                7. MULTIPLY SPECIES FACTORS BY ANNUAL EMISSIONS
                8. PRODUCE A DIAGNOSTIC REPORT
;
***** 1 -- READ THE CONTROL OPTIONS FILE
;
*---- OPEN FILES AND DEFINE ARRAYS
;
DATA ONE(DROP=TYPE); INFILE COF EOF=WRITE;
  ARRAY MAJCAT $ 8 MAJCAT1-MAJCAT15;
  ARRAY NUM_SP NUM_SP1-NUM_SP15;
  RETAIN SCE DETAIL SASMEM SFFLG MAJCAT1-MAJCAT15 NUM_SP1-NUM_SP15
         NUMSP RUN_ID INDX2;
  START=0;
  FINISH=0;
  INPUT @1 TYPE 1. @;
*;
*---- INVALID CONTROL RECORD (TYPE NOT 1 OR 2)
;
  IF TYPE NE 1 AND TYPE NE 2 THEN DO;
     PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
     ABORT;
  END;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION)
;
  IF TYPE=1 THEN DO;
*;
```

```
*     CHECK FOR TOO MANY TYPE 1 RECORDS.
;
    INDX1+1;
    IF INDX1>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN CONTROL FILE';
      ABORT;
    END;
*;
*     INPUT AND CHECK DATA
;
    INPUT @3 SCE $2. @6 DETAIL $1. @8 SASMEM $8. @17 SFFLG $2.
          @20 RUN_ID $56.;
    IF SCE NE 'AS' THEN DO;
      PUT '*** FATAL: INVALID SOURCE TYPE ' SCE=;
      ABORT;
    END;
    IF DETAIL NE 'D' AND DETAIL NE 'S' AND DETAIL NE 'T' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT ' DETAIL=;
      ABORT;
    END;
    IF SFFLG NE 'YY' AND SFFLG NE 'YN' AND SFFLG NE 'NY' THEN DO;
      PUT '*** FATAL: INVALID SPECIATION FLAGS SPECIFIED ' SFFLG=;
      ABORT;
    END;
    RETURN;
  END;
*;
*---- TYPE 2 CONTROL RECORD (SPECIATION FILE FORMAT).
;
  IF TYPE=2 THEN DO;
*;
*     CHECK FOR TOO MANY TYPE 2 RECORDS
;
    INDX2+1;
    IF INDX2>15 THEN DO;
      PUT '*** FATAL: TOO MANY POLLUTANT CLASSES SPECIFIED';
      ABORT;
    END;
*;
*     INPUT AND CHECK DATA
;
    _I_=INDX2;
    INPUT @3 MAJCAT $8. @12 NUM_SP 2.;
*;
*---- ATHC MUST BE FIRST;
*;
    IF _I_=1 AND MAJCAT NE 'ATHC' THEN DO;
      PUT '*** FATAL: THC IS NOT FIRST CATEGORY IN CONTROL FILE';
      ABORT;
    END;
*;
*---- ANOX MUST BE SECOND;
*;
    IF _I_=2 AND MAJCAT NE 'ANOX' THEN DO;
      PUT '*** FATAL: NOX IS NOT SECOND CATEGORY IN CONTROL FILE';
      ABORT;
    END;
*;
    IF NUM_SP>32 THEN DO;
```

```
      PUT '*** FATAL: GREATER THAN 32 SUBCLASSES SPECIFIED';
      ABORT;
    END;
    NUMSP+NUM_SP;
    RETURN;
  END;
*;
*---- BEFORE OUTPUT, CREATE COUNTERS FOR PSPLIT AND SFF FILES;
*---- AS WELL AS ARRAY START AND FINISH POINTS BASED ON FLAGS;
*;
WRITE: SFF=SUM(OF NUM_SP3-NUM_SP15);
       PSPLIT=SUM(NUM_SP1,NUM_SP2);
       IF SFFLG='YY' OR SFFLG='YN' THEN START=1;
          ELSE START=(PSPLIT+1);
       IF SFFLG='YY' OR SFFLG='NY' THEN FINISH=NUMSP;
          ELSE FINISH=PSPLIT;
*;
*---- CHECK IF SPECIATION SPECIFIED;
*;
  IF NUMSP=. THEN DO;
    PUT '*** FATAL: NO SPECIATION REQUESTED IN CONTROL FILE';
    ABORT;
  END;
*;
  OUTPUT;
*;
*---- CREATE MACRO VARIABLES FROM CONTROL OPTIONS FILE;
*;
  CALL SYMPUT('PSPLIT',PSPLIT);
  CALL SYMPUT('SFF',SFF);
  CALL SYMPUT('SFFLG',SFFLG);
  CALL SYMPUT('SASMEM',SASMEM);
  CALL SYMPUT('INDX2',INDX2);
  CALL SYMPUT('DETAIL',DETAIL);
  CALL SYMPUT('NUMSP',NUMSP);
  CALL SYMPUT('START',START);
  CALL SYMPUT('FINISH',FINISH);
  RUN;
  DATA ONE; SET ONE;
*;
***** 2 -- READ THE PSPLIT FILE IF SO INSTRUCTED IN THE COF
;
       %PSPIN
*;
***** 3 -- READ THE SFF FILE IF SO INSTRUCTED IN THE COF
;
       %SFFIN
*;
***** 4 -- MERGE THE PSPLIT AND SFF FILES IF BOTH EXIST
;
       %PSPMER
*;
***** 5 -- SORT EMISSION FILE AND APPLY TIMEZONE DATA
;
       %TIMEZONE
*;
***** 6 -- MERGE EMISSION FILE WITH SPECIATION FILE
***** 7 -- MULTIPLY SPECIATION FACTORS BY ANNUAL EMISSIONS
;
```

```
      %SORTMER
*;
***** 8 -- WRITE DIAGNOSTIC REPORT
;
*---- DEFINE FILE, ASSIGN ARRAY AND INITIALIZE VARIABLES
;
  DATA _NULL_; SET ONE;
    ARRAY MAJCAT $ 8 MAJCAT1-MAJCAT15;
    ARRAY NUM_SP NUM_SP1-NUM_SP15;
    FILE PRINT NOTITLES;
    IF DETAIL='S' THEN REPO=' SUMMARY';
        ELSE IF DETAIL='T' THEN REPO='   TOTALS';
        ELSE REPO='DETAILED';
    DT=DATE();TM=TIME();
    RUNCOL=66-LENGTH(RUN_ID)/2;
*;
*---- PRINT HEADER
;
  PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
      @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
      @110 'SPECIATION MODULE (SM)'//@2 'DIAGNOSTIC REPORT'
      @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
      'CONTROL FILE LISTING' @77 55*'-'//;
*;
*---- PRINT TYPE 1 RECORD
;
  PUT @2 'RUN IDENTIFICATION RECORD:'//@5 'SOURCE: ' SCE ' DETAIL: '
      DETAIL ' SAS FILE: ' SASMEM ' PSPLIT,SFF FLAGS: 'SFFLG ' RUN ID: '
      RUN_ID///;
*;
*---- PRINT TYPE 2 RECORDS
;
  IF INDX2>0 THEN DO;
    PUT @2 'POLLUTANT SPECIES DEFINITION RECORDS:'//
        @51 '          MAJOR     # OF'/
        @51 'RECORD #  POLLUTANT   SPECIES'/
        @51 '-----------------------------'/;
    DO _I_=1 TO INDX2;
      PUT @53 _I_ 2. @61 MAJCAT $8. @75 NUM_SP 2./;
    END;
    PUT @51 '---------------------------- '/_PAGE_;
  END;
*;
*---- PRINT SF IDENTITY USING SAROAD DESCRIPTIONS IN SAROAD FILE;
*;
  DATA SAROAD; INFILE SAROAD;
    INPUT @1 CLASS 7. @9 LABEL $40.;
*;
  PROC SORT DATA=SAROAD;
    BY CLASS;
  PROC SORT DATA=CLASSES;
    BY CLASS;
*;
  DATA MATCH;
    MERGE SAROAD CLASSES(IN=IN2);
    BY CLASS;
    IF IN2;
*;
  PROC SORT DATA=MATCH;
```

```
    BY ORDER;
*;
  DATA _NULL_; SET MATCH;
    FILE PRINT HEADER=H NOTITLES;
    PUT @40 ORDER 3. +4 CLASS 7. +4 LABEL $40.;
    RETURN;
*;
H:  PUT @37 '                  SPECIE DESCRIPTIONS'//
       @37 '   SF   POLLUTANT                POLLUTANT'/
       @37 ' NUMBER   SAROAD                DESCRIPTION'/
       @37 '---------------------------------------------------------'/;
*;
*---- PROCESS DETAILED REPORT (NOTE S, T, AND D REPRESENT
*---- INCREMENTAL LEVELS OF DETAIL)
;
   %DETAIL
*;
********************
* END MAIN PROGRAM *
********************
;
*;
```

APPENDIX F

SPATIAL ALLOCATION MODULE

```
OPTIONS DQUOTE;
*-----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: SPATIAL ALLOCATION MODULE (SAM) - POINT SOURCES

  LANGUAGE: SAS(VERSION 5.08)

  PURPOSE: ASSIGN A USER-DEFINED GRID MATRIX BASED ON LATITUDE
           AND LONGITUDE.

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME          ROUTINE                DESCRIPTION
========================================================================
TYPE            MAIN       CONTROL OPTION RECORD TYPE
DETAIL          MAIN       LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
SCE             MAIN       SOURCE TYPE TO PROCESS
SASMEM          MAIN       MEMBER NAME OF SAS LIBRARY (EISIN) TO PROCESS
RUN_ID          MAIN       RUN IDENTIFICATION HEADER
NLAT            MAIN       NORTHERNMOST LATITUDE OF GRID
SLAT            MAIN       SOUTHERNMOST LATITUDE OF GRID
ILAT            MAIN       NUMBER OF GRIDS PER DEGREE LATITUDE
WLON            MAIN       WESTERNMOST LONGITUDE OF GRID
ELON            MAIN       EASTERNMOST LONGITUDE OF GRID
ILON            MAIN       NUMBER OF GRIDS PER DEGREE LONGITUDE

  VARIABLE LIST: ADDITIONS TO EMISSION RECORDS

NAME          ROUTINE                DESCRIPTION
========================================================================
LAT             LOCATE     FRACTIONAL LATITUDE
LON             LOCATE     FRACTIONAL LONGITUDE
ROW             LOCATE     GRID ROW
COL             LOCATE     GRID COLUMN

  VARIABLE LIST: GENERAL

NAME          ROUTINE                DESCRIPTION
========================================================================
GRID_ROW        MAIN       NUMBER OF ROWS IN GRID
GRID_COL        MAIN       NUMBER OF COLUMNS IN GRID
GRID_TOT        MAIN       TOTAL NUMBER OF CELLS IN GRID
LAT_DEG         UNUSED     DEGREES LATITUDE
LON_DEG         UNUSED     DEGREES LONGITUDE
LAT_MIN         UNUSED     MINUTES LATITUDE
LON_MIN         UNUSED     MINUTES LONGITUDE
LAT_SEC         UNUSED     SECONDS LATITUDE
LON_SEC         UNUSED     SECONDS LONGITUDE
UTM_ZONE        LOCATE     UTM ZONE
UTMX            LOCATE     UTM HORIZONTAL COORDINATE
UTMY            LOCATE     UTM VERTICAL COORDINATE
LATX            LOCATE     TEMPORARY VARIABLE
LONX            LOCATE     TEMPORARY VARIABLE
UTMYX           LOCATE     TEMPORARY VARIABLE
LONY            LOCATE     TEMPORARY VARIABLE

  ERROR HANDLING:  INPUT DATA FROM CONTROL FILE IS CHECKED FOR
```

```
                   VALIDITY. EACH EMISSION RECORD IS CHECKED FOR
                   INCLUSION INSIDE THE GRID.

  CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

  METHOD:  SAM INPUTS THE CONTROL OPTIONS FILE AND CHECKS THE DATA FOR
           VALIDITY. ROW AND COLUMNS ARE CALCULATED USING POLAR OR UTM
           COORDINATES.

  PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, JULY 1985
    MODIFIED: DANIEL DULLEBA, ALLIANCE TECHNOLOGIES CORP., JANUARY 1988
              OUTPUTS OUTLIERS TO SEPARATE FILE AND MAIN EMISSIONS FILE

*----------------------------------------------------------------------*

****************************
* MACRO DEFINITION SECTION *
****************************

***** MACRO LOCATE

***** MERGE COF WITH EISIN, AND CALCULATE
      LOCATIONS FOR POINT SOURCES.
;
%MACRO LOCATE;
%*;
%*--- MERGE COF AND EMISSION FILE
;
  DATA OUTFILE1.&SASMEM(DROP=UTM_ZONE UTMX UTMY)
       OUTFILE2.NOLOC
       OUTFILE2.OUTSIDE;
       IF _N_=1 THEN SET ONE;
       SET INFILE.&SASMEM;
       DROP RUN_ID SCE DETAIL SASMEM SLAT NLAT ILAT WLON GRID_ROW
         GRID_COL GRID_TOT ELON ILON LATX LONX UTMYX LONY;
*;
*---- CALCULATE ROW AND COL FROM LAT AND LON
;
  * LAT=LAT_DEG+(LAT_MIN/60)+(LAT_SEC/3600);
  * LON=LON_DEG+(LON_MIN/60)+(LON_SEC/3600);
    COL=INT((WLON-LON)*ILON)+1;
    ROW=INT((LAT-SLAT)*ILAT)+1;
*;
*---- IF MISSING CALCULATE ROW AND COL USING UTMS
;
    IF ROW=. OR COL=. THEN DO;
      LATX=UTMY/111;
      LONX=(UTMX-500)/((111.226+0.0053*LATX)*(COS(0.017453*LATX)));
      UTMYX=UTMY-(3187*SIN(2*0.017453*LATX)*(1-COS(0.017453*LONX)));
      LAT=(UTMYX-2.41-0.00903*LATX*LATX)/110.270;
      LONY=(UTMX-500)/((111.226+0.0053*LAT)*(COS(0.017453*LAT)));
      LON=180-(6*UTM_ZONE)+3-LONY;
      COL=INT((WLON-LON)*ILON)+1;
      ROW=INT((LAT-SLAT)*ILAT)+1;
*;
*---- IF STILL MISSING, OUTPUT TO ERROR FILE
;
      IF ROW=. OR COL=. THEN DO;
        OUTPUT OUTFILE2.NOLOC;
```

```
          RETURN;
        END;
      END;
 *;
 *---- IF OUTSIDE OF GRID, OUTPUT TO OUTLIER FILE
 ;
      IF ROW<1 OR ROW>GRID_ROW OR COL<1 OR COL>GRID_COL THEN DO;
        OUTPUT OUTFILE2.OUTSIDE;
 *
 *---- OUTPUT OUTLIERS TO MAIN FILE AND OUTLIER FILE
 *;
 *      RETURN;
      END;
 *;
 *---- IF PROCESSING REACHES HERE, OUTPUT TO SPATIALLY ALLOCATED FILE
 ;
      SAF=1;
      OUTPUT OUTFILE1.&SASMEM;
      RETURN;
 *;
 %*;
 %*--- END OF MACRO LOCATE
 ;
 %MEND LOCATE;
 *;
 ***** MACRO REPORT

 ***** GENERATE REPORTS FOR A VARIETY OF CONDITIONS
 ;
 %MACRO REPORT;
 %*;
 %*---- COMPLETE SUMMARY REPORT
 ;
    PROC PRINT DATA=OUTFILE2.NOLOC;
    VAR SCC STATE COUNTY PLANT_ID POINT_ID;
    FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
    TITLE 'POINT SOURCE EMISSION RECORDS CONTAINING NO LOCATION DATA';
    PROC PRINT DATA=OUTFILE2.OUTSIDE;
    VAR SCC STATE COUNTY PLANT_ID POINT_ID LAT LON COL ROW;
    FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
    TITLE 'POINT SOURCES OUTSIDE OF GRID BOUNDRIES';
 %*;
 %*---- DETAILED REPORT
 ;
 %IF &DETAIL=D %THEN %DO;
   PROC PRINT DATA=OUTFILE1.&SASMEM(OBS=50);
   ID SCC STATE COUNTY;
   VAR PLANT_ID POINT_ID LAT LON COL ROW;
   TITLE 'GRID LOCATIONS OF EMISSION RECORDS';
   FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
 %END;
 %*;
 %MEND REPORT;
 *;
 ****************************
 * END OF MACRO DEFINITIONS *
 ****************************

 *********************
 * MAIN PROGRAM: SAM *
```

```
**********************

***** THIS PROGRAM WILL:

                  1. READ AND VALIDATE CONTROL OPTIONS FILE (COF)
                  2. MERGE COF WITH EMISSION FILE
                  3. PRODUCE A DIAGNOSTIC REPORT
;
***** READ CONTROL FILE
;
*---- OPEN FILE AND INPUT RECORD TYPE
;
DATA ONE(DROP=TYPE INDX1 INDX2);INFILE COF EOF=WRITE;
  RETAIN SCE DETAIL SASMEM RUN_ID NLAT SLAT ILAT WLON ELON ILON
        GRID_ROW GRID_COL GRID_TOT;
  INPUT @1 TYPE 1. @;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION)
;
  IF TYPE=1 THEN DO;
*;
*---- CHECK FOR TOO MANY TYPE 1 RECORDS
;
    INDX1+1;
    IF INDX1>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN CONTROL FILE';
      ABORT;
    END;
*;
*---- INPUT AND CHECK DATA
;
    INPUT @3 SCE $2. @6 DETAIL $1. @8 SASMEM $8. @17 RUN_ID $56.;
    IF DETAIL NE 'D' AND DETAIL NE 'S' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT' DETAIL=;
      ABORT;
    END;
    IF SCE NE 'PS' THEN DO;
      PUT '*** FATAL: INVALID EIS FILE TYPE ' SCE=;
      ABORT;
    END;
    RETURN;
  END;
*;
*---- TYPE 2 CONTROL RECORD (GRID DEFINITION)
;
  IF TYPE=2 THEN DO;
*;
*---- CHECK FOR TOO MANY TYPE 2 RECORDS
;
    INDX2+1;
    IF INDX2>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 2 RECORD IN CONTROL FILE';
      ABORT;
    END;
*;
*---- INPUT AND CHECK DATA
;
    INPUT @3 SLAT 2. @6 NLAT 2. @9 ILAT 2. @12 WLON 3. @16 ELON 3.
          @20 ILON 2.;
    GRID_ROW=(NLAT-SLAT)*ILAT;
```

```
     GRID_COL=(WLON-ELON)*ILON;
     GRID_TOT=GRID_ROW*GRID_COL;
     RETURN;
   END;
 *;
 *---- INVALID CONTROL RECORD
 ;
   PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
   ABORT;
 *;
 WRITE: OUTPUT;
 *;
 ***** CALL MERGE MACRO
 ;
 CALL SYMPUT('SASMEM',SASMEM);
 RUN;
 %LOCATE
 *;
 ***** WRITE DIAGNOSTIC REPORT
 ;
 *---- ECHO CONTROL FILE
 ;
 DATA _NULL_;SET ONE;
   FILE PRINT NOTITLES;
   IF DETAIL='S' THEN REPO=' SUMMARY';ELSE REPO='DETAILED';
   DT=DATE(); TM=TIME();
   RUNCOL=66-LENGTH(RUN_ID)/2;
 *;
 *---- PRINT HEADER
 ;
   PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
       @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
       @101 'SPATIAL ALLOCATION MODULE (SAM)'//
       @2 'DIAGNOSTIC REPORT'
       @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
       'CONTROL FILE LISTING' @77 55*'-'//;
 *
 *---- COF TYPE 1 RECORD (RUN IDENTIFICATION)
 ;
   PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SOURCE: ' SCE ' DETAIL: '
       DETAIL ' SAS FILE: ' SASMEM ' RUN ID: ' RUN_ID///;
 *
 *---- COF TYPE 2 RECORD (GRID SPECIFICATION)
 ;
   PUT @2 'GRID DEFINITION RECORD:'//@25 'NORTH LATITUDE: ' NLAT 2.
       @89 'WEST LONGITUDE: ' WLON 3./@25 'SOUTH LATITUDE: ' SLAT 2.
       @89 'EAST LONGITUDE: ' ELON 3.//@51 ' GRIDS PER DEGREE LATITUDE: '
       ILAT 2./@51 'GRIDS PER DEGREE LONGITUDE: ' ILON 2./@63
       'NUMBER OF ROWS: ' GRID_ROW 7./@60 'NUMBER OF COLUMNS: '
       GRID_COL 7./@62 'NUMBER OF GRIDS: ' GRID_TOT 7./_PAGE_;
 *
 *---- PRINT ERROR FILES AND EMISSION FILE IF REQUESTED
 ;
 CALL SYMPUT('DETAIL',DETAIL);
 CALL SYMPUT('SASMEM',SASMEM);
 RUN;
 %REPORT
 *;
 **********************
 * END OF MAIN PROGRAM *
 **********************
 ;
```

```
*OPTIONS DQUOTE;
*----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: SPATIAL ALLOCATION MODULE (SAM) - AREA SOURCES

  LANGUAGE: SAS(VERSION 5.08)

  PURPOSE: FOR AREA SOURCES, TO APPLY SPATIAL ALLOCATION DATA TO
           COUNTIES EMISSIONS.

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME         ROUTINE              DESCRIPTION
========================================================================
TYPE          MAIN       CONTROL OPTION RECORD TYPE
DETAIL        MAIN       LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
SCE           MAIN       SOURCE TYPE TO PROCESS
SASMEM        MAIN       MEMBER NAME OF SAS LIBRARY (EISIN) TO PROCESS
RUN_ID        MAIN       RUN IDENTIFICATION HEADER
NLAT          MAIN       NORTHERNMOST LATITUDE OF GRID
SLAT          MAIN       SOUTHERNMOST LATITUDE OF GRID
ILAT          MAIN       NUMBER OF GRIDS PER DEGREE LATITUDE
WLON          MAIN       WESTERNMOST LONGITUDE OF GRID
ELON          MAIN       EASTERNMOST LONGITUDE OF GRID
ILON          MAIN       NUMBER OF GRIDS PER DEGREE LONGITUDE

  VARIABLE LIST: ADDITIONS TO EMISSION RECORDS

NAME         ROUTINE              DESCRIPTION
========================================================================
ROW           ALLOCATE   GRID ROW
COL           ALLOCATE   GRID COLUMN
SAF           ALLOCATE   SPATIAL ALLOCATION FACTOR

  VARIABLE LIST: SPATIAL ALLOCATION FACTOR FILE

NAME         ROUTINE              DESCRIPTION
========================================================================
NEDSID        ALLOCATE   STATE AND COUNTY CODE
NCOL1-NCOL160 ALLOCATE   GRID COLUMN
NROW1-NROW160 ALLOCATE   GRID ROW
NSAF1-NSAF160 ALLOCATE   SPATIAL ALLOCATION FACTOR
NGRID         ALLOCATE   NUMBER OF GRIDS IN COUNTY
SCC           ALLOCATE   AREA SOURCE CATEGORY NUMBER (PSEUDO SCC)

  VARIABLE LIST: GENERAL

NAME         ROUTINE              DESCRIPTION
========================================================================
STATE         ALLOCATE   STATE CODE
COUNTY        ALLOCATE   COUNTY CODE
IN1           ALLOCATE   EMISSION FILE MERGE FLAG
IN2           ALLOCATE   SPATIAL ALLOCATION FACTOR FILE MERGE FLAG
_I_           ALLOCATE   ARRAY INDEX
GRID_ROW      MAIN       NUMBER OF ROWS IN GRID
GRID_COL      MAIN       NUMBER OF COLUMNS IN GRID
GRID_TOT      MAIN       TOTAL NUMBER OF CELLS IN GRID
```

```
  ERROR HANDLING:  INPUT DATA FROM CONTROL FILE IS CHECKED FOR
                   VALIDITY. EACH EMISSION RECORD IS CHECKED FOR
                   INCLUSION INSIDE THE GRID.

  CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

  METHOD:  SAM INPUTS THE CONTROL OPTIONS FILE AND CHECKS THE DATA FOR
           VALIDITY.  IF THE EMISSION FILE IS AREA SOURCES, THE DATA
           ARE MERGED WITH THE SPATIAL ALLOCATION FACTOR FILE AND MULTIP

  PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, JULY 1985
    MODIFIED: DANIEL DULLEBA, ALLIANCE TECHNOLOGIES CORP., JANUARY 1988
              SAVES ORPHAN FILE TO PERMANENT DATA SET

*-------------------------------------------------------------------*

****************************
* MACRO DEFINITION SECTION *
****************************

***** MACRO ALLOCATE

***** READ SPATIAL ALLOCATION FACTOR FILE, MERGE WITH EMISSION FILE, AND
      MULTIPLY EMISSIONS BY FACTORS.
;
%MACRO ALLOCATE;
%*;
***** INPUT SPATIAL ALLOCATION FILE
;
  DATA SAFFIN.SASSAFF(DROP=NCOL1-NCOL160 NROW1-NROW160
    NSAF1-NSAF160 NGRID RECORD);
  INFILE SAFF;
    ARRAY NCOL NCOL1-NCOL160;
    ARRAY NROW NROW1-NROW160;
    ARRAY NSAF NSAF1-NSAF160;
    INPUT @1 STATE 2. @3 COUNTY 4. SCC 5. NGRID 3. @;
    DO _I_=1 TO NGRID;
      INPUT NCOL 4. NROW 4. NSAF 5.4 @;
      COL=NCOL;
      ROW=NROW;
      SAF=NSAF;
      RECORD+1;
      IF RECORD>=&FIRST AND RECORD<=&LAST THEN OUTPUT;
      IF RECORD>=&LAST THEN STOP;
    END;
*;
***** SORT SPATIAL FILE TO PREP FOR MERGE
;
  PROC SORT DATA=SAFFIN.SASSAFF OUT=SAFFOUT.SASSAFF;
    BY SCC STATE COUNTY;
*;
***** MERGE EMISSION FILE WITH SPATIAL FILE
;
  DATA SAMOUT.&SASMEM(DROP=SAF &LIST)
       ORPHAN.DATA(KEEP=SCC STATE COUNTY &LIST);
  MERGE SAFFOUT.SASSAFF(IN=IN2) SAMIN.&SASMEM(IN=IN1);
    BY SCC STATE COUNTY;
    ARRAY POLL &LIST;
    ARRAY POLLS &LISTS;
  ERROR HANDLING:  INPUT DATA FROM CONTROL FILE IS CHECKED FOR
                   VALIDITY. EACH EMISSION RECORD IS CHECKED FOR
                   INCLUSION INSIDE THE GRID.

  CALLED BY: USER SPECIFIED RUNSTREAM (JCL)

  METHOD:  SAM INPUTS THE CONTROL OPTIONS FILE AND CHECKS THE DATA FOR
           VALIDITY.  IF THE EMISSION FILE IS AREA SOURCES, THE DATA
           ARE MERGED WITH THE SPATIAL ALLOCATION FACTOR FILE AND MULTIP

  PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, JULY 1985
    MODIFIED: DANIEL DULLEBA, ALLIANCE TECHNOLOGIES CORP., JANUARY 1988
              SAVES ORPHAN FILE TO PERMANENT DATA SET

*-----------------------------------------------------------------------*

*****************************
* MACRO DEFINITION SECTION *
*****************************

***** MACRO ALLOCATE

***** READ SPATIAL ALLOCATION FACTOR FILE, MERGE WITH EMISSION FILE, AND
      MULTIPLY EMISSIONS BY FACTORS.
;
%MACRO ALLOCATE;
%*;
***** INPUT SPATIAL ALLOCATION FILE
;
  DATA SAFFIN.SASSAFF(DROP=NCOL1-NCOL160 NROW1-NROW160
    NSAF1-NSAF160 NGRID RECORD);
  INFILE SAFF;
    ARRAY NCOL NCOL1-NCOL160;
    ARRAY NROW NROW1-NROW160;
    ARRAY NSAF NSAF1-NSAF160;
    INPUT @1 STATE 2. @3 COUNTY 4. SCC 5. NGRID 3. @;
    DO _I_=1 TO NGRID;
      INPUT NCOL 4. NROW 4. NSAF 5.4 @;
      COL=NCOL;
      ROW=NROW;
      SAF=NSAF;
      RECORD+1;
      IF RECORD>=&FIRST AND RECORD<=&LAST THEN OUTPUT;
      IF RECORD>=&LAST THEN STOP;
    END;
*;
***** SORT SPATIAL FILE TO PREP FOR MERGE
;
  PROC SORT DATA=SAFFIN.SASSAFF OUT=SAFFOUT.SASSAFF;
    BY SCC STATE COUNTY;
*;
***** MERGE EMISSION FILE WITH SPATIAL FILE
;
  DATA SAMOUT.&SASMEM(DROP=SAF &LIST)
       ORPHAN.DATA(KEEP=SCC STATE COUNTY &LIST);
  MERGE SAFFOUT.SASSAFF(IN=IN2) SAMIN.&SASMEM(IN=IN1);
    BY SCC STATE COUNTY;
    ARRAY POLL &LIST;
    ARRAY POLLS &LISTS;
```

```
*;
*---- COMPLETE EMISSION RECORD IF IN1 AND IN2. MULTIPLY SAF BY
      EMISSIONS;
*;
  IF IN1 AND IN2 THEN DO;
    DO OVER POLL;
      POLLS-POLL*SAF;
    END;
    OUTPUT SAMOUT.&SASMEM;
  END;
*;
*---- EMISSION DATA WITHOUT SPATIAL DATA
;
  ELSE DO;IF IN1 THEN OUTPUT ORPHAN.DATA;END;
*;
%*;
%*--- END OF MACRO ALLOCATE
;
%MEND ALLOCATE;
*;
***** MACRO REPORT

***** GENERATE REPORTS FOR A VARIETY OF CONDITIONS
;
%MACRO REPORT;
%*;
%*---- GENERATE EMISSION SUMS IF REQUESTED;
%*;
%IF &DETAIL-T OR &DETAIL-D %THEN %DO;
  PROC MEANS MAXDEC-4 SUM DATA-SAMOUT.&SASMEM;
  VAR &LISTS;
  TITLE 'SPATIALLY ALLOCATED EMISSIONS';
%END;
%*;
%*---- COMPLETE SUMMARY REPORT
;
   PROC PRINT DATA-ORPHAN.DATA UNIFORM;
   VAR STATE COUNTY SCC &LIST;
   SUM &LIST;
   TITLE 'EMISSIONS RECORDS WITH NO SPATIAL ALLOCATION FACTORS';
   FORMAT STATE Z2. COUNTY Z4. SCC Z8.;
%*;
%*---- DETAILED REPORT
;
%IF &DETAIL-D %THEN %DO;
  PROC PRINT DATA-SAMOUT.&SASMEM(OBS-200);
  ID SCC STATE COUNTY;
  VAR COL ROW;
  TITLE 'GRID LOCATIONS OF EMISSION RECORDS (200 OBS)';
  FORMAT SCC Z8. STATE Z2. COUNTY Z4.;
%END;
%*;
%MEND REPORT;
*;
****************************
* END OF MACRO DEFINITIONS *
****************************

*********************
```

```
* MAIN PROGRAM: SAM *
*********************

***** THIS PROGRAM WILL:

                1. READ AND VALIDATE CONTROL OPTIONS FILE (COF)
                2. MERGE COF WITH EMISSION FILE
                3. PROCESS DATA ACCORDING TO SOURCE TYPE
                4. PRODUCE A DIAGNOSTIC REPORT
;
***** READ CONTROL FILE
;
*---- OPEN FILE AND INPUT RECORD TYPE
;
DATA ONE(DROP=TYPE INDX1-INDX4);INFILE COF EOF=WRITE;
  RETAIN SCE DETAIL SASMEM RUN_ID NLAT SLAT ILAT WLON ELON ILON
         GRID_ROW GRID_COL GRID_TOT FIRST LAST LIST LISTS;
  INPUT @1 TYPE 1. @;
*;
*---- TYPE 1 CONTROL RECORD (RUN IDENTIFICATION)
;
  IF TYPE=1 THEN DO;
*;
*---- CHECK FOR TOO MANY TYPE 1 RECORDS
;
    INDX1+1;
    IF INDX1>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 1 RECORD IN CONTROL FILE';
      ABORT;
    END;
*;
*---- INPUT AND CHECK DATA
;
    INPUT @3 SCE $2. @6 DETAIL $1. @8 SASMEM $8. @17 RUN_ID $56.;
    IF DETAIL NE 'D' AND DETAIL NE 'S' AND DETAIL NE 'T' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT' DETAIL=;
      ABORT;
    END;
    IF SCE NE 'AS' THEN DO;
      PUT '*** FATAL: INVALID EIS FILE TYPE ' SCE=;
      ABORT;
    END;
    RETURN;
  END;
*;
*---- TYPE 2 CONTROL RECORD (GRID DEFINITION)
;
  IF TYPE=2 THEN DO;
*;
*---- CHECK FOR TOO MANY TYPE 2 RECORDS
;
    INDX2+1;
    IF INDX2>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 2 RECORD IN CONTROL FILE';
      ABORT;
    END;
*;
*---- INPUT AND CHECK DATA
;
```

```
    INPUT @3 SLAT 2. @6 NLAT 2. @9 ILAT 2. @12 WLON 3. @16 ELON 3.
          @20 ILON 2.;
    GRID_ROW=(NLAT-SLAT)*ILAT;
    GRID_COL=(WLON-ELON)*ILON;
    GRID_TOT=GRID_ROW*GRID_COL;
    RETURN;
  END;
*;
*---- TYPE 3 CONTROL RECORD (SUBFILE DEFINITION);
*;
  IF TYPE=3 THEN DO;
*;
*---- CHECK FOR TOO MANY TYPE 3 RECORDS;
*;
    INDX3+1;
    IF INDX3>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 3 RECORD IN CONTROL FILE';
      ABORT;
    END;
*;
*---- INPUT AND CHECK DATA;
*;
    INPUT @3 FIRST LAST;
    NUMBER=LAST-FIRST;
    IF NUMBER>66000000 THEN DO;
      PUT '*** FATAL: NUMBER OF SUBFILE RECORDS EXCEEDS 66,000,000';
      ABORT;
    END;
    RETURN;
*;
  END /* TYPE 3 */;
*;
*---- TYPE 4 CONTROL RECORD (POLLUTANT LIST);
*;
  IF TYPE=4 THEN DO;
*;
*---- CHECK FOR TOO MANY TYPE 4 RECORDS;
*;
    INDX4+1;
    IF INDX4>1 THEN DO;
      PUT '*** FATAL: MORE THAN ONE TYPE 4 RECORD';
      ABORT;
    END;
*;
*---- INPUT DATA;
*;
    INPUT @3 LIST $70./@3 LISTS $70.;
    RETURN;
*;
  END /* TYPE 4 */;
*;
*---- INVALID CONTROL RECORD
;
  PUT '*** FATAL: INVALID CONTROL RECORD ' TYPE=;
  ABORT;
*;
WRITE: OUTPUT;
*;
***** CALL MERGE MACRO
```

```
;
CALL SYMPUT('SASMEM',SASMEM);
CALL SYMPUT('FIRST',FIRST);
CALL SYMPUT('LAST',LAST);
CALL SYMPUT('LIST',LIST);
CALL SYMPUT('LISTS',LISTS);

RUN;
%ALLOCATE
*;
***** WRITE DIAGNOSTIC REPORT
;
*---- ECHO CONTROL FILE
;
DATA _NULL_;SET ONE;
  FILE PRINT NOTITLES;
  IF DETAIL='S' OR DETAIL='T' THEN REPO=' SUMMARY';ELSE REPO='DETAILED';
  DT=DATE(); TM=TIME();
  RUNCOL=66-LENGTH(RUN_ID)/2;
*;
*---- PRINT HEADER
;
  PUT @2 'DATE: ' @8 DT DATE7. @21 'TIME: ' @27 TM TIME8.//
      @2 'FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)'
      @101 'SPATIAL ALLOCATION MODULE (SAM)'//
      @2 'DIAGNOSTIC REPORT'
      @RUNCOL RUN_ID @116 REPO @125 'LISTING'//@2 53*'-' @56
      'CONTROL FILE LISTING' @77 55*'-'//;
*
*---- COF TYPE 1 RECORD (RUN IDENTIFICATION)
;
  PUT @2 'RUN IDENTIFICATION RECORD:'//@7 'SOURCE: ' SCE ' DETAIL: '
      DETAIL ' SAS FILE: ' SASMEM ' RUN ID: ' RUN_ID///;
*
*---- COF TYPE 2 RECORD (GRID SPECIFICATION)
;
  PUT @2 'GRID DEFINITION RECORD:'//@25 'NORTH LATITUDE: ' NLAT 2.
      @89 'WEST LONGITUDE: ' WLON 3./@25 'SOUTH LATITUDE: ' SLAT 2.
      @89 'EAST LONGITUDE: ' ELON 3.//@51 ' GRIDS PER DEGREE LATITUDE: '
      ILAT 2./@51 'GRIDS PER DEGREE LONGITUDE: ' ILON 2./@63
      'NUMBER OF ROWS: ' GRID_ROW 7./@60 'NUMBER OF COLUMNS: '
      GRID_COL 7./@62 'NUMBER OF GRIDS: ' GRID_TOT 7.//;
*;
*---- COF TYPE 3 RECORD (SUBFILE DEFINITION);
*;
    NUMBER=LAST-FIRST+1;
    PUT @2 'SUBFILE DEFINITION RECORD:'//
        @7 ' LAST RECORD: ' LAST 11./
        @7 'FIRST RECORD: ' FIRST 11./
        @6 '--------------------------'/
        @7 'TOTAL RECORDS:' NUMBER 11. ///;
*;
*---- COF TYPE 4 RECORD (POLLUTANT LIST);
*;
    PUT @2 'POLLUTANT DEFINITION RECORD'//
        @7 'VARIABLE LIST: ' LIST $70. /
        @22 LISTS $70.///;
*;
*;
```

```
*---- PRINT ERROR FILES AND EMISSION FILE IF REQUESTED
;
CALL SYMPUT('DETAIL',DETAIL);
CALL SYMPUT('SASMEM',SASMEM);
CALL SYMPUT('LISTS',LISTS);
RUN;
%REPORT
*;
************************
* END OF MAIN PROGRAM *
************************
 ;
```

APPENDIX G

MODEL INPUT PREPROCESSOR

```
OPTIONS MPRINT;
*---------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM: MODEL INPUT PREPROCESSOR - POINT AND AREA SOURCES

  LANGUAGE: SAS (VERSION 5.08)

  PURPOSE: FOR AREA SOURCES, TO COMBINE EMISSIONS SUBFILES
           BY (COLUMN,ROW) OR (SCC,STATE,COUNTY) AND GREENWICH MEAN TIME
           FOR POINT SOURCES, TO CONCATENATE EMISSIONS SUBFILES AND
           SORT BY COLUMN AND ROW.

  VARIABLE LIST: CONTROL OPTIONS FILE

NAME         ROUTINE                    DESCRIPTION
=======================================================================
TYPE           MAIN       CONTROL OPTIONS RECORD TYPE
SOURCE         MAIN       SOURCE TYPE OF EMISSION FILE
DETAIL         MAIN       LEVEL OF DETAIL FOR DIAGNOSTIC REPORT
INNUM          MAIN       NUMBER OF INPUT SUBFILES TO COMBINE
RUN_ID         MAIN       RUN IDENTIFICATION HEADER
VARLIST        MAIN       POLLUTANT VARIABLE LIST (AREA SOURCES ONLY)
EMRES          MAIN       EMISSIONS RESOLUTION (AREA SOURCES ONLY)

  VARIABLE LIST: GENERAL

NAME         ROUTINE                    DESCRIPTION
=======================================================================
COL      POINT,COMBINE    GRID COLUMN
ROW      POINT,COMBINE    GRID ROW
GMT         COMBINE       GREENWICH MEAN TIME
SCC         COMBINE       SOURCE CLASSIFICATION CODE
STATE       COMBINE       STATE CODE
COUNTY      COMBINE       COUNTY CODE

  ERROR HANDLING:
     ERRORS IN THE CONTROL FILE WILL HALT EXECUTION.


  METHOD: MIP INPUTS AND CHECKS THE CONTROL OPTIONS FILE.
          DEPENDING ON SOURCE TYPE, SUBFILES ARE COMBINED
          OR CONCATENATED AND SORTED.

 PROGRAMMER: DON NEAL, ALLIANCE TECHNOLOGIES CORPORATION, SEPTEMBER 1985
  UPDATED:    DON NEAL JULY 1986
              ANDREW ACKERMAN, ALLIANCE TECH CORP, JUNE 1987

   MODIFIED: DANIEL DULLEBA, ALLIANCE TECHNOLOGIES CORP., JANUARY 1988
             DOES NOT PERFORM MEANS AND SORT FOR ONLY ONE INPUT FILE

   MODIFIED: DANIEL DULLEBA, ALLIANCE TECHNOLOGIES CORP., AUGUST 1988
             PERFORMS SORT FOR AREA SOURCES, REGARDLESS OF THE
             NUMBER OF INPUT FILES

*---------------------------------------------------------------------*
*;
```

```
***** FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

***** MODEL INPUT PREPROCESSOR

***** MIP WILL COMBINE AREA SOURCE SUBFILES OUTPUT FROM MTPREP
      BY (COL,ROW) OR (SCC,STATE,COUNTY) GMT.  FOR POINT SOURCES,
      CONCATENATE AND SORT BY COLUMN AND ROW.
*;
***** MACRO COMBINE

***** COMBINE MERGES AREA SOURCE SUBFILES AND SUMS BY
      (COL,ROW) OR (SCC,STATE,COUNTY) AND GMT.
*;
%MACRO COMBINE;
*;
%LET EMRES=%SUBSTR(&EMRES,1,1);
DATA MIPIN.DATA; SET
%*;
%*---- GENERATE SET STATEMENT;
%*;
%DO I=1 %TO &INNUM;
  IN&I..DATA
%END;
;
PROC SORT DATA=MIPIN.DATA OUT=SORTED.DATA;
%*;
  %IF &EMRES=G %THEN
    %LET EMBY=%STR( COL ROW);
  %ELSE
    %LET EMBY=%STR( SCC STATE COUNTY);
*;
  BY &EMBY GMT;
*;
***** SUM IDENTICAL GRIDS AND HOURS IF MORE THAN ONE INPUT FILE;
*;
%IF &INNUM > 1 %THEN %DO;
  PROC MEANS NOPRINT SUM DATA=SORTED.DATA;
    BY &EMBY GMT;
    VAR &VARLIST;
    OUTPUT OUT=MIPOUT.DATA SUM=&VARLIST;
%END;
%IF &INNUM=1 %THEN %DO;
  DATA MIPOUT.DATA; SET SORTED.DATA; BY &EMBY GMT;
%END;
*;
%MEND COMBINE;
*;
***** MACRO POINT

***** MACRO TO CONCATENATE POINT SOURCE FILES AND SORT BY
      COL ROW.
*;
%MACRO POINT;
*;
***** CONCATENATE SUBFILES;
*;
DATA MIPIN.DATA;RETAIN COL ROW;SET
%*;
%*---- GENERATE SET STATEMENT;
```

```
%*;
%DO I-1 %TO &INNUM;
  IN&I..DATA
%END;
           ;
*;
***** SORT MIPIN IF MORE THAN ONE INPUT FILE, STORE IN MIPOUT;
*;
%IF &INNUM > 1 %THEN %DO;
  PROC SORT DATA-MIPIN.DATA OUT-MIPOUT.DATA;
    BY COL ROW;
%END;
%IF &INNUM-1 %THEN %DO;
  DATA MIPOUT.DATA; SET MIPIN.DATA;
%END;
*;
%MEND POINT;
*;
***** MACRO DETAIL

***** MACRO WILL GENERATE HOURLY SUMS FOR AREA SOURCES;

%MACRO DETAIL;
*;
***** SORT MIPOUT AND STORE AS BACKUP DATASET;
*;
PROC SORT DATA-MIPOUT.DATA OUT-MIPBACK.DATA;
  BY GMT;
*;
***** EXECUTE MEANS BY HOUR;
*;
PROC MEANS SUM NOPRINT DATA-MIPBACK.DATA;
  BY GMT;
  VAR &VARLIST;
  OUTPUT OUT-MEANS SUM-&VARLIST;
*;
PROC PRINT DATA-MEANS;
  TITLE 'HOURLY EMISSIONS';
  ID GMT;
*;
%MEND DETAIL;
*;
***** MACRO CHOOSE

***** MACRO TO CONTROL PROGRAM EXECUTION;

%MACRO CHOOSE;
%IF &SOURCE-AS %THEN %DO;
  %COMBINE;
%*;
  %IF &DETAIL-T %THEN %DO;
    %DETAIL;
  %END;
%END;
%ELSE %DO;
  %POINT;
%END;
%*;
%MEND CHOOSE;
```

```
*;
***** MAIN PROGRAM;

***** THIS PROGRAM WILL:
             1. READ AND VALIDATE THE COF.
             2. CALL THE PROPER MACROS FOR PROCESSING
*;
DATA ONE;INFILE COF EOF-WRITE;
*;
RETAIN;
   INPUT @1 TYPE 1. @;
*;
*---- TYPE 1 RECORD (RUN IDENTIFICATION);
*;
IF TYPE-1 THEN DO;
  INPUT @3 INNUM 1. @5 DETAIL $1. @7 SOURCE $2. @10 RUN_ID $62.;
*;
*---- CHECK INPUT;
*;
  IF DETAIL NE 'T' AND DETAIL NE 'S' THEN DO;
    PUT '*** FATAL: INVALID OPTION FOR DIAGNOSTIC REPORT';
    ABORT;
  END;
  IF SOURCE NE 'PS' AND SOURCE NE 'AS' THEN DO;
    PUT '*** FATAL: INVALID SOURCE FILE SPECIFICATION';
    ABORT;
  END;
  RETURN;
END;
*;
*---- TYPE 2 CONTROL RECORD (POLLUTANT VARIABLE LIST);
*;
IF TYPE-2 THEN DO;
  IF SOURCE NE 'AS' THEN DO;
    PUT '*** FATAL: INVALID RECORD FOR SOURCE TYPE';
    ABORT;
  END;
  INPUT @3 VARLIST $70.;
  RETURN;
END;
*;
*---- TYPE 3 CONTROL RECORD (EMISSIONS RESOLUTION);
*;
  IF TYPE-3 THEN DO;
    IF SOURCE NE 'AS' THEN DO;
      PUT '*** FATAL: INVALID RECORD FOR SOURCE TYPE';
      ABORT;
    END;
    INPUT @3 EMRES $10.;
    IF EMRES NE 'GRIDDED' AND EMRES NE 'NONGRIDDED' THEN DO;
      PUT '*** FATAL: INVALID OPTION FOR EMISSIONS RESOLUTION' EMRES-;
      ABORT;
    END;
*;
    RETURN;
  END;
*;
*---- INVALID CONTROL RECORD;
*;
```

```
PUT '*** FATAL: INVALID CONTROL RECORD TYPE';
ABORT;
*;
WRITE:OUTPUT;
*;
*---- CREATE MACRO VARIABLES AND CALL CHOOSE MACRO;
*;
CALL SYMPUT('SOURCE',SOURCE);
CALL SYMPUT('DETAIL',DETAIL);
CALL SYMPUT('INNUM',INNUM);
CALL SYMPUT('VARLIST',VARLIST);
CALL SYMPUT('EMRES',EMRES);
*;
RUN;
*;
%CHOOSE;
```

```
OPTIONS MPRINT MISSING=' ';
*-----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM:  POINT SOURCE SAS TO EBCDIC MODELER'S TAPE CONVERSION

  LANGUAGE:  SAS (VERSION 5.16)

  PURPOSE:  TO PRODUCE POINT SOURCE EBCDIC MODELER'S TAPE FROM
            SAS DATA SET

  COF VARIABLE LIST

NAME                               DESCRIPTION
-------------------------------------------------------------------------
NUMSPEC                  NUMBER OF POLLUTANT SPECIES FACTORS


  ERROR HANDLING:  INVALID VALUE IN CONTROL OPTIONS FILE WILL
                   HALT EXECUTION.

  METHOD:  READS AND CHECKS CONTROL OPTIONS FILE.  WRITES EMISSIONS.

  PROGRAMMER:  ANDREW ACKERMAN, ALLIANCE TECH CORP, JUNE 1987
  MODIFIED:    LYSA LEBOWITZ, ALLIANCE TECH CORP, SEPTEMBER 1987

*-----------------------------------------------------------------------*

***** MACRO DEFINITION *****;

***** MACRO WRITE

***** WRITE SAS EMISSIONS DATA INTO EBCDIC FILE
;
%MACRO WRITE;
%LET NUMSPEC = %EVAL(&NUMSPEC);
*;
DATA _NULL_;SET INFILE.DATA;
ARRAY SAROAD SAROAD1-SAROAD15;
ARRAY EMISS EMISS1-EMISS15;
ARRAY SEA SEA1-SEA12;
ARRAY DAY DAY1-DAY12;
ARRAY HFGMT (NUMHRS) HFGMT1-HFGMT288;
ARRAY CAT CAT1-CAT&NUMSPEC;
ARRAY CLASS CLASS1-CLASS&NUMSPEC;
ARRAY CONEFF CONEFF1-CONEFF15;
ARRAY SF SF1-SF&NUMSPEC;
ARRAY ESTMET ESTMET1-ESTMET15;
  FILE FILE1;
    PUT @1 SCC Z8. STATE Z2. COUNTY Z4. PLANT_ID $4. POINT_ID $2.
        AQCR Z3. SIC 4. LAT 8.5 LON 9.5 COL 4.
        ROW 4. ZONE 1. DAYLITE 1. FLOW 7. PLUME_HT 4. STACK_DI 4.1
        STACK_HT 4. STACK_TP 4. VELOCITY 9.2 HCHOWT 6.4
        NUMPOLL 2. @;
        DO _I_=1 TO NUMPOLL;
          PUT SAROAD 5. EMISS 8.1 @;
        END;
    PUT NUM_DAY 2. @;
```

```
        DO _I_=1 TO 12;
          PUT SEA 5.3 DAY 6.4 @;
          START=(_I_-1)*24+1;
          FINISH=START+23;
          DO NUMHRS=START TO FINISH;
            PUT HFGMT 6.4 @;
          END;
        END;
    PUT NUMSP 3. @;
        DO _I_=1 TO &NUMSPEC;
          PUT CAT 5. CLASS 7. SF E11. @;
        END;
        DO _I_=1 TO NUMPOLL;
          PUT  CONEFF 4.1 ESTMET 1. @;
        END;
    PUT;
%MEND WRITE;

***** END OF MACRO DEFINITION *****;

***** READ CONTROL OPTIONS FILE
;
DATA _NULL_;
  INFILE COF;
  INPUT @1 NUMSPEC 3.;

* CHECK FOR INVALID COF DATA;
  IF NUMSPEC LT 0 THEN DO;
    PUT '*** FATAL: INVALID NUMBER OF SPECIES' NUMSPEC=;
    ABORT;
    END;

* BRIEF DIAGNOSTIC REPORT (ECHO COF);
  FILE PRINT NOTITLES;
  PUT // @2 '*** EBCDIC-PS DIAGNOSTIC REPORT ***'//
       @2 '     NUMBER OF SPECIES: ' NUMSPEC=;
*;
CALL SYMPUT('NUMSPEC',NUMSPEC);
RUN;
%WRITE
```

```
OPTIONS MPRINT MISSING=' ';
*----------------------------------------------------------------------*

  APPLICATION: FLEXIBLE REGIONAL EMISSIONS DATA SYSTEM (FREDS)

  PROGRAM:  AREA SOURCE SAS TO EBCDIC MODELER'S TAPE CONVERSION

  LANGUAGE:  SAS (VERSION 5.16)

  PURPOSE:  TO PRODUCE AREA SOURCE EBCDIC MODELER'S TAPES FROM SAS
            DATA SET.

  VARIABLE LIST

NAME                            DESCRIPTION
========================================================================
NUMPOLL               NUMBER OF POLLUTANTS IN EMISSIONS FILE
EMRES                 EMISSIONS RESOLUTION (GRIDDED OR NONGRIDDED)
GMT                   HOUR OF EMISSIONS (GREENWICH MEAN TIME)
COL                   GRID COLUMN
ROW                   GRID ROW
SCC                   SOURCE CLASSIFICATION CODE
STATE                 STATE CODE
COUNTY                COUNTY CODE
TOT1-TOT&NUMPOLL      EMISSIONS TOTALS

  ERROR HANDLING:  INVALID VALUES IN CONTROL OPTIONS FILE WILL
                   HALT EXECUTION.

  METHOD:  READS AND CHECKS CONTROL OPTIONS FILE.  WRITES EMISSIONS DATA
           TO TWO EBCDIC FILES: FOR GRIDDED EMISSSIONS, ALL RECORDS
           WITH COL <= 100 ARE WRITTEN TO FILE1, ALL OTHERS TO FILE2 --
           FOR NON-GRIDDED EMISSIONS, ALL RECORDS ARE WRITTEN TO FILE1.

  PROGRAMMER:  ANDREW ACKERMAN, ALLIANCE TECH CORP, JUNE 1987

*----------------------------------------------------------------------*

***** MACRO DEFINITION *****;

***** MACRO WRITE

***** WRITE SAS EMISSIONS DATA INTO EBCDIC FILES
;
%MACRO WRITE;
%LET NUMPOLL = %EVAL(&NUMPOLL);
%LET EMRES = %SUBSTR(&EMRES,1,1);
%*;
DATA _NULL_; SET INFILE.DATA;
  %IF &EMRES=G %THEN %DO;
     FILE FILE1;
     PUT @1 (COL ROW) (4.) GMT 2. (TOT1-TOT&NUMPOLL) (E10.);
    %END;
  %ELSE %DO;
    FILE FILE1;
    PUT @1 SCC 8. STATE 2. COUNTY 4. GMT 2.
           (TOT1-TOT&NUMPOLL) (E10.);
    %END;
```

```
%*;
%MEND WRITE;

***** END OF MACRO DEFINITION *****;

***** READ CONTROL OPTIONS FILE
;
DATA _NULL_;
  INFILE COF;
  INPUT @1 NUMPOLL 3. @5 EMRES $10.;

* CHECK FOR INVALID COF DATA;
  IF NUMPOLL < 1 THEN DO;
    PUT '*** FATAL: INVALID NUMBER OF POLLUTANTS' NUMPOLL=;
    ABORT;
    END;
  ELSE IF EMRES NE 'GRIDDED' AND EMRES NE 'NONGRIDDED' THEN DO;
    PUT '*** FATAL:  INVALID EMISSIONS RESOLUTION' EMRES=;
    ABORT;
    END;

* BRIEF DIAGNOSTIC REPORT (ECHO COF);
  FILE PRINT NOTITLES;
  PUT // @2 '*** EBCDIC-AS DIAGNOSTIC REPORT ***'//
         @2 '    NUMBER OF POLLUTANTS: ' NUMPOLL= /
         @2 '    EMISSIONS RESOLUTION: ' EMRES=;
*;
CALL SYMPUT('NUMPOLL',NUMPOLL);
CALL SYMPUT('EMRES',EMRES);
RUN;
%WRITE
```

APPENDIX H

DEFINITION OF PARAMETERS AND CODE LISTINGS

Table H-1 contains pollutant SAROAD codes and speciation factor classes used in the 1985 NAPAP Inventory. The ten pollutants contained in the annual inventory and their corresponding SAROAD codes are left justified in this table. Table H-2 presents size class codes for particulate matter. Codes for NEDS point source estimation methods are given in Table H-3. Table H-4 summarizes the reference numbers for each of the twelve temporal allocation scenarios. Time zone codes for each of the zones in the NAPAP domain are given with the I/O format for the Time Zone File. Tables H-5 through H-7 contain NEDS source classification codes for U.S. and Canadian point sources, U.S. area sources, and Canadian area sources, respectively.

TABLE H-1. 1985 NAPAP INVENTORY POLLUTANT SAROAD CODES

Pollutant	SAROAD Code
SO_2	42401
SO_4	12403
TSP:	11101
- Ca	12111
- Mg	12140
- K	12180
- Na	12184
HCl (Hydrogen Chloride)	42302
HF (Hydrogen Fluoride)	42303
NO_x:	42603
- NO	42601
- NO_2	42602
NH_3	42604
VOC	43104
THC (Total Hydrocarbons):	43101
- Methane	1*
- Ethane	2
- Propane	3
- Alkanes (0.25 - 0.50 reactive)	4
- Alkanes (0.50 - 1.00 reactive)	5
- Alkanes (1.00 - 2.00 reactive)	6
- Alkanes (> 2.00 reactive)	7
- Alkane/aromatic mix	8
- Ethene	9
- Propene	10
- Alkenes (primary)	11
- Alkenes (internal)	12
- Alkenes (primary/internal mix)	13
- Benzene, halobenzenes	14
- Aromatics (< 2.00 reactive)	15
- Aromatics (> 2.00 reactive)	16
- Phenols and cresols	17
- Styrenes	18
- Formaldehyde	19
- Higher aldehydes	20
- Acetone	21
- Higher Ketones	22
- Organic Acids	23
- Acetylene	24
- Haloalkanes	25

* SAROAD codes do not exist for all hydrocarbon species classes. These classes are referenced using a class number (1 to 32) as a surrogate SAROAD code in the PSPLIT File.

TABLE H-1. (continued)

Pollutant	SAROAD Code
- Unreactive	26
- Others (< 0.25 reactive)	27
- Others (0.25 - 0.50 reactive)	28
- Others (0.50 - 1.00 reactive)	29
- Others (> 1.00 reactive)	30
- Unidentified	31
- Unassigned	32

TABLE H-2. 1985 NAPAP INVENTORY SIZE CLASS CODES FOR PARTICULATE MATTER

Size Range (microns)	Size Class Code
0 - 2.5	10
2.5 - 6.0	20
2.5 - 10.0	30
6.0 - 10.0	40
Total	50

TABLE H-3. POINT SOURCE EMISSIONS ESTIMATION METHODS USED IN NEDS

AEROS Code	Estimation Method
0	Not applicable (emissions are negligible)
1	Emission based on source test or emission measurements
2	Emissions calculated using a material balance
3	Emissions computer calculated using AP-42 emission factors from the NEDS SCC listing
4	Emission estimated using an emission factor from a similar process
5	Emissions estimated using a special emission factor
6	New construction, not yet operational
7	Facility closed, operations ceased

TABLE H-4. REFERENCE NUMBERS FOR TEMPORAL ALLOCATION SCENARIOS

Temporal allocation reference number	Scenario
1	Winter Weekday
2	Winter Saturday
3	Winter Sunday
4	Spring Weekday
5	Spring Saturday
6	Spring Sunday
7	Summer Weekday
8	Summer Saturday
9	Summer Sunday
10	Fall Weekday
11	Fall Saturday
12	Fall Sunday

TABLE H-5. NEDS SOURCE CLASSIFICATION CODES FOR U.S. AND CANADIAN POINT SOURCES (SIX-DIGIT LEVEL)

SCC	Source Description/Process		
101001	EXTCOMB BOILER	ELECTRIC GENERATN	ANTHRACITE COAL
101002	EXTCOMB BOILER	ELECTRIC GENERATN	BITUMINOUS COAL
101003	EXTCOMB BOILER	ELECTRIC GENERATN	LIGNITE
101004	EXTCOMB BOILER	ELECTRIC GENERATN	RESIDUAL OIL
101005	EXTCOMB BOILER	ELECTRIC GENERATN	DISTILLATE OIL
101006	EXTCOMB BOILER	ELECTRIC GENERATN	NATURAL GAS
101007	EXTCOMB BOILER	ELECTRIC GENERATN	PROCESS GAS
101008	EXTCOMB BOILER	ELECTRIC GENERATN	COKE
101009	EXTCOMB BOILER	ELECTRIC GENERATN	WOOD/BARK WASTE
101010	EXTCOMB BOILER	ELECTRIC GENERATN	LIQ PETROLEUM GAS
101011	EXTCOMB BOILER	ELECTRIC GENERATN	BAGASSE
101012	EXTCOMB BOILER	ELECTRIC GENERATN	SLD WASTE-SPECIFY
101013	EXTCOMB BOILER	ELECTRIC GENERATN	LIQ WASTE-SPECIFY
102001	EXTCOMB BOILER	INDUSTRIAL	ANTHRACITE COAL
102002	EXTCOMB BOILER	INDUSTRIAL	BITUMINOUS COAL
102003	EXTCOMB BOILER	INDUSTRIAL	LIGNITE
102004	EXTCOMB BOILER	INDUSTRIAL	RESIDUAL OIL
102005	EXTCOMB BOILER	INDUSTRIAL	DISTILLATE OIL
102006	EXTCOMB BOILER	INDUSTRIAL	NATURAL GAS
102007	EXTCOMB BOILER	INDUSTRIAL	PROCESS GAS
102008	EXTCOMB BOILER	INDUSTRIAL	COKE
102009	EXTCOMB BOILER	INDUSTRIAL	WOOD/BARK WASTE
102010	EXTCOMB BOILER	INDUSTRIAL	LIQ PETROLEUM GAS
102011	EXTCOMB BOILER	INDUSTRIAL	BAGASSE
102012	EXTCOMB BOILER	INDUSTRIAL	SLD WASTE-SPECIFY
102013	EXTCOMB BOILER	INDUSTRIAL	LIQ WASTE-SPECIFY
102014	EXTCOMB BOILER	INDUSTRIAL	CO BOILER
103001	EXTCOMB BOILER	COMMERCL-INSTUTNL	ANTHRACITE COAL
103002	EXTCOMB BOILER	COMMERCL-INSTUTNL	BITUMINOUS COAL
103003	EXTCOMB BOILER	COMMERCL-INSTUTNL	LIGNITE
103004	EXTCOMB BOILER	COMMERCL-INSTUTNL	RESIDUAL OIL
103005	EXTCOMB BOILER	COMMERCL-INSTUTNL	DISTILLATE OIL
103006	EXTCOMB BOILER	COMMERCL-INSTUTNL	NATURAL GAS
103007	EXTCOMB BOILER	COMMERCL-INSTUTNL	PROCESS GAS
103009	EXTCOMB BOILER	COMMERCL-INSTUTNL	WOOD/BARK WASTE
103010	EXTCOMB BOILER	COMMERCL-INSTUTNL	LIQ PETROLEUM GAS
103012	EXTCOMB BOILER	COMMERCL-INSTUTNL	SLD WASTE-SPECIFY
103013	EXTCOMB BOILER	COMMERCL-INSTUTNL	LIQ WASTE-SPECIFY
105001	EXTCOMB BOILER	SPACE HEATER	INDUSTRIAL

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
105002	EXTCOMB BOILER	SPACE HEATER	COMMERCL-INSTUTNL
201001	INTERNLCOMBUSTION	ELECTRIC GENERATN	DIST.OIL/DIESEL
201002	INTERNLCOMBUSTION	ELECTRIC GENERATN	NATURAL GAS
201009	INTERNLCOMBUSTION	ELECTRIC GENERATN	KERONAPTHA JET FL
201010	INTERNLCOMBUSTION	ELECTRIC GENERATN	GEYSERS/GEOTHERML
202001	INTERNLCOMBUSTION	INDUSTRIAL	DIST.OIL/DIESEL
202002	INTERNLCOMBUSTION	INDUSTRIAL	NATURAL GAS
202003	INTERNLCOMBUSTION	INDUSTRIAL	GASOLINE
202004	INTERNLCOMBUSTION	INDUSTRIAL	LARGE BORE ENGINE
202005	INTERNLCOMBUSTION	INDUSTRIAL	RESIDUAL/CRUDEOIL
202009	INTERNLCOMBUSTION	INDUSTRIAL	KERONAPTHA JET FL
202010	INTERNLCOMBUSTION	INDUSTRIAL	PROPANE
203001	INTERNLCOMBUSTION	COMMERCL-INSTUTNL	DIST.OIL/DIESEL
203002	INTERNLCOMBUSTION	COMMERCL-INSTUTNL	NATURAL GAS
203003	INTERNLCOMBUSTION	COMMERCL-INSTUTNL	GASOLINE
203010	INTERNLCOMBUSTION	COMMERCL-INSTUTNL	PROPANE
204001	INTERNLCOMBUSTION	ENGINE TESTING	AIRCRAFT
204002	INTERNLCOMBUSTION	ENGINE TESTING	ROCKET MOTOR
204003	INTERNLCOMBUSTION	ENGINE TESTING	TURBINE
204004	INTERNLCOMBUSTION	ENGINE TESTING	RECIPROCATING
288888	INTERNLCOMBUSTION	FUGITIVE EMISSION	NOT CLASSIFIED
301001	CHEMICAL MFG	ORGANIC CHEMICALS	ADIPIC ACID PROD
301003	CHEMICAL MFG	AGRICULTURAL CHEM	AMMONIA
301005	CHEMICAL MFG	CARBON BLACK	CHANNEL PROCESS
301006	CHEMICAL MFG	ORGANIC CHEMICALS	CHARCOAL
301007	CHEMICAL MFG	INORGANIC CHEMCLS	CHLORINE
301008	CHEMICAL MFG	INORGANIC CHEMCLS	CHLORO-ALKALI
301009	CHEMICAL MFG	SOAP/DETERGENTS	SOAP/DETERGENTS
301010	CHEMICAL MFG	EXPLOSIVES	TRINITROTOLUENE
301011	CHEMICAL MFG	INORGANIC CHEMCLS	HYDROCHLORIC ACID
301012	CHEMICAL MFG	INORGANIC CHEMCLS	HYDROFLUORIC ACID
301013	CHEMICAL MFG	AGRICULTURAL CHEM	NITRIC ACID
301014	CHEMICAL MFG	PAINT MFG	MIXING/BLENDING
301015	CHEMICAL MFG	VARNISH MFG	BODYING OIL
301016	CHEMICAL MFG	AGRICULTURAL CHEM	PHOS ACD/WET PROC
301017	CHEMICAL MFG	AGRICULTURAL CHEM	PHOS ACID THERMAL
301018	CHEMICAL MFG	PLASTICS PRODN	POLYVINYL CHLORID
301019	CHEMICAL MFG	ORGANIC CHEMICALS	PHTHALIC ANHYDRID
301020	CHEMICAL MFG	PRINTING INK MFG	VEHICLE COOKING
301021	CHEMICAL MFG	INORGANIC CHEMCLS	SODIUM CARBONATE
301022	CHEMICAL MFG	INORGANIC CHEMCLS	H2SO4-CHAMBER

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
301023	CHEMICAL MFG	INORGANIC CHEMCLS	H2SO4-CONTACT
301024	CHEMICAL MFG	PLASTICS PRODN	SYNTHC ORGNC FIBR
301025	CHEMICAL MFG	PLASTICS PRODN	CELLULOSIC FIBER
301026	CHEMICAL MFG	PLASTICS PRODN	SYNTHETIC RUBBER
301027	CHEMICAL MFG	AGRICULTURAL CHEM	FERTILIZ AMONNITR
301028	CHEMICAL MFG	AGRICULTURAL CHEM	NRM SPRPHSPHATE
301029	CHEMICAL MFG	AGRICULTURAL CHEM	TRPL SPRPHSPHATE
301030	CHEMICAL MFG	AGRICULTURAL CHEM	AMMONM PHOSPHATES
301031	CHEMICAL MFG	ORGANIC CHEMICALS	TEREPHTHALIC ACID
301032	CHEMICAL MFG	INORGANIC CHEMCLS	SULFUR(ELEMENTAL)
301033	CHEMICAL MFG	AGRICULTURAL CHEM	PESTICIDES
301034	CHEMICAL MFG	ORGANIC CHEMICALS	ANILINE
301035	CHEMICAL MFG	INORGANIC CHEMCLS	TIO2 PIGMENT
301038	CHEMICAL MFG	INORGANIC CHEMCLS	SODIUM BICARBNATE
301039	CHEMICAL MFG	INORGANIC CHEMCLS	HYDROGEN CYANIDE
301040	CHEMICAL MFG	AGRICULTURAL CHEM	UREA
301041	CHEMICAL MFG	EXPLOSIVES	NITROCELLULOSE
301042	CHEMICAL MFG	ORGANIC CHEMICALS	LEAD ALKYL-NA/PB
301043	CHEMICAL MFG	ORGANIC CHEMICALS	LEAD ALKYLS
301045	CHEMICAL MFG	AGRICULTURAL CHEM	ORGANIC FERTILIZR
301050	CHEMICAL MFG	ORGANIC CHEMICALS	ADHESIVES
301060	CHEMICAL MFG	PHARMACEUTICALS	GENERAL PROCESSES
301070	CHEMICAL MFG	INORGANIC CHEMCLS	GENERAL PROCESSES
301091	CHEMICAL MFG	ORGANIC CHEMICALS	KETONE PRODUCTION
301100	CHEMICAL MFG	ORGANIC CHEMICALS	MALEIC ANHYDRIDE
301111	CHEMICAL MFG	INORGANIC CHEMCLS	ASBESTOS CHEMICAL
301120	CHEMICAL MFG	ORGANIC CHEMICALS	FORMALDEHYDE
301121	CHEMICAL MFG	ORGANIC CHEMICALS	ORGNC DYE/PIGMENT
301124	CHEMICAL MFG	ORGANIC CHEMICALS	CHLOROPRENE
301125	CHEMICAL MFG	ORGANIC CHEMICALS	ETHYLENE DICHLORD
301126	CHEMICAL MFG	ORGANIC CHEMICALS	ORGANOHALOGENS
301127	CHEMICAL MFG	ORGANIC CHEMICALS	FLUOROCARBONS
301130	CHEMICAL MFG	AGRICULTURAL CHEM	AMMONIUM SULFATE
301132	CHEMICAL MFG	ORGANIC CHEMICALS	ORGANIC ACIDS PRD
301133	CHEMICAL MFG	ORGANIC CHEMICALS	ACETIC ANHYDRIDE
301137	CHEMICAL MFG	ORGANIC CHEMICALS	ESTERS PRODUCTN
301140	CHEMICAL MFG	ORGANIC CHEMICALS	ACETYLENE PRODN
301152	CHEMICAL MFG	ORGANIC CHEMICALS	BISPHENOL A
301153	CHEMICAL MFG	ORGANIC CHEMICALS	BUTADIENE
301156	CHEMICAL MFG	ORGANIC CHEMICALS	CUMENE
301157	CHEMICAL MFG	ORGANIC CHEMICALS	CYCLOHEXANE

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
301158	CHEMICAL MFG	ORGANIC CHEMICALS	CYCLOHEXANONE/CYC
301167	CHEMICAL MFG	ORGANIC CHEMICALS	VINYL ACETATE
301169	CHEMICAL MFG	ORGANIC CHEMICALS	ETHYLBENZENE
301174	CHEMICAL MFG	ORGANIC CHEMICALS	ETHYLENE OXIDE
301176	CHEMICAL MFG	ORGANIC CHEMICALS	GLYCERIN(GLYCERL)
301181	CHEMICAL MFG	ORGANIC CHEMICALS	TOLUENE DIISOCYNT
301190	CHEMICAL MFG	ORGANIC CHEMICALS	METHYL METHACRYLT
301195	CHEMICAL MFG	ORGANIC CHEMICALS	NITROBENZENE
301197	CHEMICAL MFG	ORGANIC CHEMICALS	ETHYLENE PRODCTN
301202	CHEMICAL MFG	ORGANIC CHEMICALS	PHENOL
301205	CHEMICAL MFG	ORGANIC CHEMICALS	PROPYLENE OXIDE
301206	CHEMICAL MFG	ORGANIC CHEMICALS	STYRENE
301210	CHEMICAL MFG	ORGANIC CHEMICALS	CAPROLACTUM
301211	CHEMICAL MFG	ORGANIC CHEMICALS	LINEAR ALKYLBENZE
301250	CHEMICAL MFG	ORGANIC CHEMICALS	METHANOL PRODCTN
301251	CHEMICAL MFG	ORGANIC CHEMICALS	ETHYLENE GLYCOL
301252	CHEMICAL MFG	ORGANIC CHEMICALS	ETHERS
301253	CHEMICAL MFG	ORGANIC CHEMICALS	GLYCOL ETHERS
301254	CHEMICAL MFG	ORGANIC CHEMICALS	NITRILES PROD
301258	CHEMICAL MFG	ORGANIC CHEMICALS	BENZENE
301301	CHEMICAL MFG	ORGANIC CHEMICALS	CHLOROBENZENE
301302	CHEMICAL MFG	ORGANIC CHEMICALS	CARBON TETRACHLOR
301303	CHEMICAL MFG	ORGANIC CHEMICALS	ALLYL CHLORIDE
301304	CHEMICAL MFG	ORGANIC CHEMICALS	ALLYL ALCOHOL
301305	CHEMICAL MFG	ORGANIC CHEMICALS	EPICHLOROHYDRIN
301800	CHEMICAL MFG	ORGANIC CHEMICALS	GENERAL PROCESSES
301810	CHEMICAL MFG	ORGANIC CHEMICALS	GENERAL PROCESSES
301820	CHEMICAL MFG	ORGANIC CHEMICALS	GENERAL PROCESSES
301830	CHEMICAL MFG	ORGANIC CHEMICALS	GENERAL PROCESSES
301840	CHEMICAL MFG	ORGANIC CHEMICALS	GENERAL PROCESSES
301870	INORGNC CHEM STRG	FIXED ROOF TANKS	HYDROCHLORIC ACID
301875	INORGNC CHEM STRG	FLOAT ROOF TANKS	CARBON DISULFIDE
301885	INORGNC CHEM STRG	PRESSURE TANKS	AMMONIA
301888	CHEMICAL MFG	FUGITIVE EMISSION	NOT CLASSIFIED
301900	CHEMICAL MFG	FUEL-FIRED EQPMNT	PROCESS HEATERS
301999	CHEMICAL MFG	MISCELLANEOUS	NOT CLASSIFIED
302001	FOOD/AGRICULTURE	ALFALFA DEHYDRATI	GENERAL
302002	FOOD/AGRICULTURE	COFFEE ROASTING	ROASTER
302003	FOOD/AGRICULTURE	COFFEE PRODUCTS	INSTANT COFFEE
302004	FOOD/AGRICULTURE	AGRIC. SERVICES	COTTON GINNING
302005	FOOD/AGRICULTURE	GRAIN ELEVATORS	ERMINAL ELEVATOR
302006	FOOD/AGRICULTURE	GRAIN ELEVATORS	COUNTRY ELEVATORS
302007	FOOD/AGRICULTURE	GRAIN MILLING	CORN MEAL

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
302008	FOOD/AGRICULTURE	FEED MANUFACTURE	BARLEY FEED
302009	FOOD/AGRICULTURE	FERMENTATION	BEER PRODUCTION
302010	FOOD/AGRICULTURE	FERMENTATION	WHISKEY PRODUCTN
302011	FOOD/AGRICULTURE	FERMENTATION	WINE PRODUCTION
302012	FOOD/AGRICULTURE	FISH PROCESSING	FISH MEAL
302013	FOOD/AGRICULTURE	MEAT SMOKING	COMBINED OPERATNS
302014	FOOD/AGRICULTURE	STARCH MFG	COMBINED OPERATNS
302015	FOOD/AGRICULTURE	SUGAR CANE PROCES	GENERAL
302016	FOOD/AGRICULTURE	SUGAR BEET PROCES	DRYER
302017	FOOD/AGRICULTURE	PEANUT PROCESSING	NOT CLASSIFIED
302018	FOOD/AGRICULTURE	CANDY MANUFACTURE	NOT CLASSIFIED
302019	FOOD/AGRICULTURE	VEG OIL PROCESSNG	CORN OIL
302020	FOOD/AGRICULTURE	AGRIC.PRODUCTION	BEEF CATTLE
302021	FOOD/AGRICULTURE	POULTRY/EGG PROD	MANURE HANDLING
302022	FOOD/AGRICULTURE	AGRIC.PRODUCTION	COTTON-ACID DELIN
302026	FOOD/AGRICULTURE	AGRIC.PRODUCTION	SEED PROCESSING
302028	FOOD/AGRICULTURE	AGRIC.PRODUCTION	MUSHROOM GROWING
302030	FOOD/AGRICULTURE	DAIRY PRODUCTS	MILK
302031	FOOD/AGRICULTURE	GRAIN ELEVATORS	EXPORT GRAIN ELEV
302032	FOOD/AGRICULTURE	BAKERIES	BREAD BAKING
302033	FOOD/AGRICULTURE	TOBACCO PRODUCTS	NOT CLASSIFIED
302036	FOOD/AGRICULTURE	DEEP FAT FRYING	COOKING VATS
302038	FOOD/AGRICULTURE	ANIMAL/POLTRY RND	RENDERING
302888	FOOD/AGRICULTURE	FUGITIVE EMISSION	NOT CLASSIFIED
302900	FOOD/AGRICULTURE	FUEL-FIRED EQPMNT	PROCESS HEATERS
302999	FOOD/AGRICULTURE	MISCELLANEOUS	NOT CLASSIFIED
303000	MINING OPERATIONS	METAL ORE MINING	BAUXITE
303001	PRIMARY METALS	ALUMINUM	ELECTRO-REDUCTION
303002	PRIMARY METALS	ALUMINUM	HYDROXIDE CALCING
303003	PRIMARY METALS	IRON & STEEL	BY-PRODUCT COKE
303004	PRIMARY METALS	IRON & STEEL	BEEHIVE COKE
303005	PRIMARY METALS	COPPER SMELTING	MULTIPLE HEARTH
303006	PRIMARY METALS	FERROALLOY	OPEN FURNACE
303007	PRIMARY METALS	FERROALLOY	SEMICOVERED FURNC
303008	PRIMARY METALS	IRON & STEEL	BLAST FURNACE
303009	PRIMARY METALS	IRON & STEEL	STEEL FURNACES
303010	PRIMARY METALS	LEAD SMELTING	SINTERING
303011	MINING OPERATIONS	METAL ORE MINING	MOLYBEDENUM
303012	MINING OPERATIONS	METAL ORE MINING	TITANIUM ORE
303013	MINING OPERATIONS	METAL ORE MINING	GOLD MINING
303014	MINING OPERATIONS	METAL ORE MINING	BARIUM ORE
303023	MINING OPERATIONS	METAL ORE MINING	TACONITE IRON ORE

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
303024	MINING OPERATIONS	METAL ORE MINING	LOW MOISTURE ORE
303030	PRIMARY METALS	ZINC SMELTING	ROASTING
303888	PRIMARY METALS	FUGITIVE EMISSION	NOT CLASSIFIED
303900	PRIMARY METALS	FUEL-FIRED EQPMNT	PROCESS HEATERS
303999	PRIMARY METALS	MISCELLANEOUS	NOT CLASSIFIED
304001	SECONDARY METALS	SEC. ALUMINUM	SWEATING FURNACE
304002	SECONDARY METALS	SEC. COPPER	ELEC INDUCTION FN
304003	PRIMARY METALS	IRON/STEEL FOUNDY	GRAY IRON FOUNDRY
304004	SECONDARY METALS	SEC. LEAD	KETTLE REFINING
304005	ELECTRICAL EQPMNT	LEAD BATTERY MFG	OVERALL PROCESS
304006	PRIMARY METALS	MAGNESIUM	POT FURNACE
304007	PRIMARY METALS	IRON/STEEL FOUNDY	STEEL FOUNDRY
304008	SECONDARY METALS	SECONDARY ZINC	RETORT FURNACE
304009	PRIMARY METALS	IRON/STEEL FOUNDY	MALLEABLE IRON
304010	PRIMARY METALS	NICKEL	FLUX FURNACE
304020	ELECTRICAL EQPMNT	FURNACE ELECTRODE	CALCINATION
304022	SECONDARY METALS	METAL HEAT TREATG	FURNACE
304040	SECONDARY METALS	METALLIC COATING	LEAD CABLE COATNG
304049	SECONDARY METALS	MISC CAST/FABRCTN	WAX BURNOUT OVEN
304050	SECONDARY METALS	MISC CAST/FABRCTN	NOT CLASSIFIED
304888	SECONDARY METALS	FUGITIVE EMISSION	NOT CLASSIFIED
304900	SECONDARY METALS	FUEL-FIRED EQPMNT	PROCESS HEATERS
304999	SECONDARY METALS	MISCELLNNEOUS	NOT CLASSIFIED
305001	PETROLEUM INDRY	ASPHALT ROOFING	ASPHALT BLOWING
305002	PETROLEUM INDRY	ASPHALT CONCRETE	ROTARY DRYER
305003	MINERAL PRODUCTS	BRICK MFG	RAW MATERIAL
305004	MINERAL PRODUCTS	CALCIUM CARBIDE	ELECTRIC FURNACE
305005	MINERAL PRODUCTS	CASTABLE REFRACTY	RAW MATERIAL
305006	MINERAL PRODUCTS	CEMENT MFG	DRY PROCESS
305007	MINERAL PRODUCTS	CEMENT MFG	WET PROCESS
305008	MINERAL PRODUCTS	CERAMIC CLAY MFG	DRYING
305009	MINERAL PRODUCTS	CLAY/FLYASH SINTR	FLYASH
305010	MINING OPERATIONS	COAL CLEANING	THERMAL DRYER
305011	MINERAL PRODUCTS	CONCRETE BATCHING	GENERAL
305012	MINERAL PRODUCTS	FIBERGLASS	WOOL-TYPE FIBER
305013	MINERAL PRODUCTS	FRIT MFG	ROTARY FURNACE
305014	MINERAL PRODUCTS	GLASS MFG	SODA LIME
305015	MINERAL PRODUCTS	GYPSUM MFG	ROTARY ORE DRYER
305016	MINERAL PRODUCTS	LIME MFG	PRIMARY CRUSHING
305017	MINERAL PRODUCTS	MINERAL WOOL	CUPOLA
305018	MINERAL PRODUCTS	PERLITE MFG	VERTICAL FURNACE
305019	MINING OPERATIONS	NONMETALLIC MINRL	PHOSPHATE ROCK
305020	MINING OPERATIONS	NONMETALLIC MINRL	STONE QUARRYING

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
305021	MINING OPERATIONS	NONMETALLIC MINRL	SALT MINING
305022	MINING OPERATIONS	NONMETALLIC MINRL	POTASH PRODUCTION
305024	MINING OPERATIONS	NONMETALLIC MINRL	MAGNESIUM CRBNATE
305025	MINING OPERATIONS	NONMETALLIC MINRL	SAND/GRAVEL
305026	MINING OPERATIONS	NONMETALLIC MINRL	DIATOMACOUS EARTH
305030	MINERAL PRODUCTS	CERAMIC ELEC PRTS	NOT CLASSIFIED
305031	MINING OPERATIONS	NONMETALLIC MINRL	ASBESTOS MINING
305032	MINING OPERATIONS	NONMETALLIC MINRL	ASBESTOS MILLING
305033	MINING OPERATIONS	NONMETALLIC MINRL	VERMICULITE
305040	MINING OPERATIONS	UNSPECIFIED ORE	SEE COMMENT
305100	MINERAL PRODUCTS	BULK MATERIALS	ELEVATORS
305101	MINERAL PRODUCTS	BULK MATERIALS	CONVEYORS
305102	MINERAL PRODUCTS	BULK MATERIALS	STOAGE BINS
305103	MINERAL PRODUCTS	BULK MATERIALS	OPEN STOCKPILES
305104	MINERAL PRODUCTS	BULK MATERIALS	UNLOADING OPERATN
305105	MINERAL PRODUCTS	BULK MATERIALS	LOADING OPERATION
305150	MINERAL PRODUCTS	NONMETALLIC MINRL	CALCINING-GENERAL
305888	MINERAL PRODUCTS	FUGITIVE EMISSION	NOT CLASSIFIED
305900	MINERAL PRODUCTS	FUEL-FIRED EQPMNT	PROCESS HEATERS
305999	MINERAL PRODUCTS	MISCELLANEOUS	NOT CLASSIFIED
306001	PETROLEUM INDRY	PETROLEUM REFNG	PROCESS HEATERS
306002	PETROLEUM INDRY	PETROLEUM REFNG	CATALYTIC CRACKNG
306003	PETROLEUM INDRY	PETROLEUM REFNG	CATALYTIC CRACKNG
306004	PETROLEUM INDRY	PETROLEUM REFNG	BLOWDOWN SYSTEM
306005	PETROLEUM INDRY	FUGITIVE HC EMIS	PROCESS DRAINS
306006	PETROLEUM INDRY	PETROLEUM REFNG	VACUUM DISTILATN
306007	PETROLEUM INDRY	PETROLEUM REFNG	COOLING TOWERS
306008	PETROLEUM INDRY	FUGITIVE HC EMIS	PIPELINE
306009	PETROLEUM INDRY	PETROLEUM REFNG	FLARES
306010	PETROLEUM INDRY	PETROLEUM REFNG	SLUDGE CONVERTER
306011	PETROLEUM INDRY	PETROLEUM REFNG	ASPHALT BLOWING
306012	PETROLEUM INDRY	PETROLEUM REFNG	FLUID COKING
306014	PETROLEUM INDRY	PETROLEUM REFNG	PETROLEUM COKE
306015	PETROLEUM INDRY	PETROLEUM REFNG	BAUXITE BURNING
306099	PETROLEUM INDRY	PETROLEUM REFNG	INCINERATORS
306100	PETROLEUM INDRY	LUBE OIL MFG	GENERAL
306888	PETROLEUM INDRY	FUGITIVE EMISSION	NOT CLASSIFIED
306009	PETROLEUM INDRY	PETROLEUM REFNG	FLARES
306010	PETROLEUM INDRY	PETROLEUM REFNG	SLUDGE CONVERTER
306011	PETROLEUM INDRY	PETROLEUM REFNG	ASPHALT BLOWING
306012	PETROLEUM INDRY	PETROLEUM REFNG	FLUID COKING

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
306014	PETROLEUM INDRY	PETROLEUM REFNG	PETROLEUM COKE
306015	PETROLEUM INDRY	PETROLEUM REFNG	BAUXITE BURNING
306099	PETROLEUM INDRY	PETROLEUM REFNG	INCINERATORS
306100	PETROLEUM INDRY	LUBE OIL MFG	GENERAL
306888	PETROLEUM INDRY	FUGITIVE EMISSION	NOT CLASSIFIED
306999	PETROLEUM INDRY	MISCELLANEOUS	NOT CLASSIFIED
307001	PULP & PAPER	KRAFT PULPING	DIGESTOR/BLOW TNK
307002	PULP & PAPER	SULFITE PULPING	DIGESTER/BLOW PIT
307003	PULP & PAPER	SEMICHEMICAL PULP	DIGESTER/BLOW PIT
307004	PULP & PAPER	PULPBOARD	PAPERBOARD
307005	WOOD PRODUCTS	WOOD PRESS TREAT	CREOSOTE
307007	WOOD PRODUCTS	PLYWOOD/PARTBOARD	VENEER DRYERS
307008	WOOD PRODUCTS	SAWMILL OPERATION	LOG DEBARKING
307011	PULP & PAPER	PAPER COATING	EXTRUSION COATING
307013	PULP & PAPER	MISC. PAPER PROD	INSULATION FROM
307020	WOOD PRODUCTS	FURNITURE MFG	NOT CLASSIFIED
307030	WOOD PRODUCTS	MISCELLANEOUS	WOODWASTE STORAGE
307888	WOOD PRODUCTS	FUGITIVE EMISSION	NOT CLASSIFIED
307900	WOOD PRODUCTS	FUEL FIRED EQPMNT	PROCESS HEATERS
307999	WOOD PRODUCTS	MISCELLANEOUS	NOT CLASSIFIED
308001	RUBBER/PLASTICS	TIRE MFG	UNDERTREAD & SIDE
308005	RUBBER/PLASTICS	TIRE RETREADING	TIRE BUFFING
308006	RUBBER/PLASTICS	MISC.RUBBER PROD	NOT CLASSIFIED
308007	RUBBER/PLASTICS	FAB. PLASTIC PROD	PLASTICS MACHINNG
308900	RUBBER/PLASTICS	FUEL FIRED EQPMNT	PROCESS HEATERS
308999	RUBBER/PLASTICS	MISCELLANEOUS	NOT CLASSIFIED
309001	FABRICATED METALS	IRON/STEEL	NOT CLASSIFIED
309002	FABRICATED METALS	ABRASIVE BLASTING	OF METAL PARTS
309003	FABRICATED METALS	ABRASIVE CLEANING	OF METAL PARTS
309010	FABRICATED METALS	ELECTROPLATING	ENTIRE PROCESS
309011	FABRICATED METALS	CONVERSION COATNG	ALKALINE CLEANING
309015	FABRICATED METALS	CHEMICAL MILLING	F METAL PARTS
309016	FABRICATED METALS	PIPE COATING	ASPHALT DIPPING
309020	FABRICATED METALS	CAN MAKING OPRNS	NOT CLASSIFIED
309025	FABRICATED METALS	DRUMS/BARRELS	DRUM CLEANING
309030	FABRICATED METALS	MACHINING OPRNS	GRINDING
309040	FABRICATED METALS	METAL DEPOSITION	METALLIZING(WIRE
309060	FABRICATED METALS	PORCELAIN ENAMEL/	CERAMIC GLAZE
309888	FABRICATED METALS	FUGITIVE EMISSION	NOT CLASSIFIED
309900	FABRICATED METALS	FUEL FIRED EQPMNT	PROCESS HEATERS

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
309999	FABRICATED METALS	MISCELLANEOUS	NOT CLASSIFIED
310001	OIL & GAS PRODN	CRUDE OIL PRODN	COMPLETE WELL
310002	OIL & GAS PRODN	NATURAL GAS PRODN	GAS SWEETENING
310004	OIL & GAS PRODN	FUEL-FIRED EQPMNT	PROCESS HEATERS
310888	OIL & GAS PRODN	FUGITIVE EMISSION	NOT CLASSIFIED
311001	CONSTRUCTION	BLDG CONTRACTORS	NOT CLASSIFIED
311002	CONSTRUCTION	SPL TRADE CONTRCT	NOT CLASSIFIED
312999	MACHINERY	MISCELLANEOUS	NOT CLASSIFIED
313070	ELECTRICAL EQPMNT	WINDINGS RECLAMTN	INCINERATOR OVEN
313900	ELECTRICAL EQPMNT	FUEL FIRED EQPMNT	PROCESS HEATERS
313999	ELECTRICAL EQPMNT	MISCELLANEOUS	NOT CLASSIFIED
314009	TRANSPORTN EQPMNT	GENERAL PROCESSES	SOLDER JOINT
314010	TRANSPORTN EQPMNT	BRAKE SHOE DEBOND	INCINERATOR OVEN
314011	TRANSPORTN EQPMNT	AUTO BODY SALVAGE	BODY SHREDDING
314999	TRANSPORTN EQPMNT	MISCELLANEOUS	NOT CLASSIFIED
315010	MISC. INDUSTRIES	PHOTOGRAPHIC EQPT	PHOTOCOPY MACHINE
315020	MISC. INDUSTRIES	HOSPITALS	STERILIZATION
320999	LEATHER PRODUCTS	MISCELLANEOUS	NOT CLASSIFIED
330001	TEXTILE PRODUCTS	GENERAL FABRICS	NOT CLASSIFIED
330002	RUBBER/PLASTICS	RUBBERIZED FABRIC	IMPREGNATION
330003	TEXTILE PRODUCTS	CARPET OPERATNS	NOT CLASSIFIED
330004	TEXTILE PRODUCTS	FABRIC FINISHING	NOT CLASSIFIED
330005	TEXTILE PRODUCTS	APPAREL	NOT CLASSIFIED
330888	TEXTILE PRODUCTS	FUGITIVE EMISSION	NOT CLASSIFIED
360001	PRINTING/PUBLISH	TYPESETTING	LEAD REMELTING
390001	INDUSTRIAL PROCES	INPROCESS FUEL	ANTHRACITE COAL
390002	INDUSTRIAL PROCES	INPROCESS FUEL	BITUMINOUS COAL
390003	INDUSTRIAL PROCES	INPROCESS FUEL	LIGNITE
390004	INDUSTRIAL PROCES	INPROCESS FUEL	RESIDUAL OIL
390005	INDUSTRIAL PROCES	INPROCESS FUEL	DISTILLATE OIL
390006	INDUSTRIAL PROCES	INPROCESS FUEL	NATURAL GAS
390007	INDUSTRIAL PROCES	INPROCESS FUEL	PROCESS GAS
390008	INDUSTRIAL PROCES	INPROCESS FUEL	COKE
390009	INDUSTRIAL PROCES	INPROCESS FUEL	WOOD
390010	INDUSTRIAL PROCES	INPROCESS FUEL	LPG
390012	INDUSTRIAL PROCES	INPROCESS FUEL	SOLID WASTE FUEL
390013	INDUSTRIAL PROCES	INPROCESS FUEL	LIQUID WASTE FUEL
399900	INDUSTRIAL PROCES	MIS IND-FUEL EQPT	PROCESS HEATERS
399999	INDUSTRIAL PROCES	MISCELLANEOUS	NOT CLASSIFIED
401001	ORGANIC SOLVENT	DRY CLEANING	PERCHLOROETHYLENE

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
401002	ORGANIC SOLVENT	VAPOR DEGREASING	OPEN-TOP
401003	ORGANIC SOLVENT	COLD CLEANING	METHANOL
401004	ORGANIC SOLVENT	TEXTILE MFG	FABRIC SCOURING
401888	ORGANIC SOLVENT	FUGITIVE EMISSION	NOT CLASSIFIED
402001	ORGANIC SOLVENT	SURFACE COATING	PAINT-GENERAL
402002	ORGANIC SOLVENT	SURFACE COATING	PAINT-GENERAL
402003	ORGANIC SOLVENT	SURFACE COATING	VARNISH/SHELLAC
402004	ORGANIC SOLVENT	SURFACE COATING	LACQUER
402005	ORGANIC SOLVENT	SURFACE COATING	ENAMEL
402006	ORGANIC SOLVENT	SURFACE COATING	PRIMER
402007	ORGANIC SOLVENT	SURFACE COATING	ADHESIVE
402008	ORGANIC SOLVENT	SURFACE COATING	COATING OVEN
402009	ORGANIC SOLVENT	SURFACE COATING	SHINNING SOLVENT
402010	ORGANIC SOLVENT	SURFACE COATING	OVEN HEATER
402011	ORGANIC SOLVENT	SURFACE COATING	FABRIC COATING
402012	ORGANIC SOLVENT	SURFACE COATING	FABRIC DYEING
402013	ORGANIC SOLVENT	SURFACE COATING	PAPER COATING
402014	ORGANIC SOLVENT	SURFACE COATING	LARGE APPLIANCES
402015	ORGANIC SOLVENT	SURFACE COATING	MAGNET WIRE
402016	ORGANIC SOLVENT	SURFACE COATING	AUTOS/LIGHT TRUCK
402017	ORGANIC SOLVENT	SURFACE COATING	CAN COATING
402018	ORGANIC SOLVENT	SURFACE COATING	COIL COATING
402019	ORGANIC SOLVENT	SURFACE COATING	WOOD FURNITURE
402020	ORGANIC SOLVENT	SURFACE COATING	METAL FURNITURE
402021	ORGANIC SOLVENT	SURFACE COATING	FLATWOOD PRODUCTS
402022	ORGANIC SOLVENT	SURFACE COATING	PLASTIC PARTS
402023	ORGANIC SOLVENT	SURFACE COATING	LARGE SHIPS
402024	ORGANIC SOLVENT	SURFACE COATING	LARGE AIRCRAFT
402025	ORGANIC SOLVENT	SURFACE COATING	MISC.METAL PARTS
402026	ORGANIC SOLVENT	SURFACE COATING	STEEL DRUMS
402888	ORGANIC SOLVENT	SURFACE COATING	FUGITIVE EMISSION
402900	ORGANIC SOLVENT	SURFACE COATING	FLARES
402999	ORGANIC SOLVENT	SURFACE COATING	MISCELLANEOUS
403001	PETROLEUM STORAGE	FIXED ROOF TANKS	BREATHING LOSS
403002	PETROLEUM STORAGE	FLOAT ROOF TANKS	STAND STG LOSS
403003	PETROLEUM STORAGE	VAR.VAPOR SP.TNKS	WORKING LOSS
403010	PETROLEUM STORAGE	FIXED ROOF TANKS	GASOLINE-RVP 13
403011	PETROLEUM STORAGE	FLOAT ROOF TANKS	GASOLINE-RVP 13
403012	PETROLEUM STORAGE	VAR.VAPOR SP.TNKS	GASOLINE-RVP 13
403888	PETROLEUM STORAGE	FUGITIVE EMISSION	NOT CLASSIFIED

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
403999	PETROLEUM STORAGE	MISCELLANEOUS	NOT CLASSIFIED
404001	BULK TERMINALS	FIXED ROOF TANKS	GASOLINE-RVP 13
404002	BULK PLANTS	FIXED ROOF TANKS	GASOLINE-RVP 13
404003	OIL & GAS PRODN	CRUDE OIL STORAGE	FIXED ROOF TANK
404004	PETROLEUM STORAGE	UNDERGROUND TANKS	GASOLINE-RVP 13
405001	PRINTING/PUBLISH	PRINTING PROCESS	DRYER
405002	PRINTING/PUBLISH	PRINTING PROCESS	LETTER PRESS
405003	PRINTING/PUBLISH	PRINTING PROCESS	FLEXOGRAPHIC
405004	PRINTING/PUBLISH	PRINTING PROCESS	LITHOGRAPHIC
405005	PRINTING/PUBLISH	PRINTING PROCESS	ROTOGRAVURE
405006	PRINTING/PUBLISH	PRINTING PROCESS	INK MIXING
405007	PRINTING/PUBLISH	PRINTING PROCESS	SOLVENT STORAGE
405888	PRINTING/PUBLISH	FUGITIVE EMISSION	NOT CLASSIFIED
406001	PETROLEUM MARKTNG	TANK CARS/TRUCKS	GASOLINE-SPLASH
406002	PETROLEUM MARKTNG	MARINE VESSELS	GASOLINE SHIP
406003	PETROLEUM MARKTNG	SERVICE STATIONS	STAGE I
406004	PETROLEUM MARKTNG	SERVICE STATIONS	STAGE II
406888	PETROLEUM MARKTNG	FUGITIVE EMISSION	NOT CLASSIFIED
407004	ORGANIC CHEM STRG	FIXED ROOF TANKS	ACETIC ANHYDRIDE
407008	ORGANIC CHEM STRG	FIXED ROOF TANKS	N-BUTYL ALCOHOL
407016	ORGANIC CHEM STRG	FIXED ROOF TANKS	N-DECANE
407020	ORGANIC CHEM STRG	FIXED ROOF TANKS	DODECENE
407032	ORGANIC CHEM STRG	FIXED ROOF TANKS	ANILINE
407036	ORGANIC CHEM STRG	FIXED ROOF TANKS	BENZENE
407040	ORGANIC CHEM STRG	FIXED ROOF TANKS	ACETIC ACID
407044	ORGANIC CHEM STRG	FIXED ROOF TANKS	BUTYL ACETATE
407048	ORGANIC CHEM STRG	FIXED ROOF TANKS	MTHL-TRT-BTYL ETH
407052	ORGANIC CHEM STRG	FIXED ROOF TANKS	BUTYL CARBITOL
407056	ORGANIC CHEM STRG	FIXED ROOF TANKS	1,4-BUTANEDIOL
407060	ORGANIC CHEM STRG	FIXED ROOF TANKS	BENZYL CHLORIDE
407064	ORGANIC CHEM STRG	FIXED ROOF TANKS	MDI
407068	ORGANIC CHEM STRG	FIXED ROOF TANKS	CYCLOHEXANONE
407076	ORGANIC CHEM STRG	FIXED ROOF TANKS	ACRYLONITRILE
407080	ORGANIC CHEM STRG	FIXED ROOF TANKS	NITROBENZENE
407084	ORGANIC CHEM STRG	FIXED ROOF TANKS	NONYPHENOL
407172	ORGANIC CHEM STRG	FLOAT ROOF TANKS	ACETALDEHYDE
407176	ORGANIC CHEM STRG	FLOAT ROOF TANKS	CYCLOHEXANE
407180	ORGANIC CHEM STRG	FLOAT ROOF TANKS	ISOPRENE
407208	ORGANIC CHEM STRG	FLOAT ROOF TANKS	ETHYL ETHER
407220	ORGANIC CHEM STRG	FLOAT ROOF TANKS	CARBON TETRACHLRD

(continued)

TABLE H-5 (continued)

SCC	Source Description/Process		
407228	ORGANIC CHEM STRG	FLOAT ROOF TANKS	ACETONE
407232	ORGANIC CHEM STRG	FLOAT ROOF TANKS	ETHYL MERCAPTAN
407816	ORGANIC CHEM STRG	PRESSURE TANKS	ETHANE
407820	ORGANIC CHEM STRG	PRESSURE TANKS	1,3-BUTADIENE
407824	ORGANIC CHEM STRG	PRESSURE TANKS	ACETYLENE
407832	ORGANIC CHEM STRG	PRESSURE TANKS	METHYLAMINE
407848	ORGANIC CHEM STRG	PRESSURE TANKS	ETHYLENE OXIDE
407860	ORGANIC CHEM STRG	PRESSURE TANKS	ETHYL CHLORIDE
407864	ORGANIC CHEM STRG	PRESSURE TANKS	METHYL ISOCYANATE
407872	ORGANIC CHEM STRG	PRESSURE TANKS	METHYL MERCAPTAN
407999	ORGANIC CHEM STRG	MISCELLANEOUS	SPECIFY IN COMMTS
408999	ORGNC CHEM TRNSPT	TANK CARS/TRUCKS	SPECIFY LIQUID
490001	ORGANIC SOLVENT	MISCELLANEOUS	SOLVENT EXTRACTN
490002	ORGANIC SOLVENT	MISCELLANEOUS	SOLVENT RECOVERY
490003	ORGANIC SOLVENT	MISCELLANEOUS	RAILCAR CLEANING
490004	ORGANIC SOLVENT	MISCELLANEOUS	TANK TRUCK CLEANG
490900	ORGANIC SOLVENT	MISCELLANEOUS	INCINERATORS
490999	ORGANIC SOLVENT	MISCELLANEOUS	NOT CLASSIFIED
501001	SOLID WASTE DISPL	GOVERNMENT	MUNICIPAL INCIN
501002	SOLID WASTE DISPL	GOVERNMENT	OPEN BURNING DUMP
501005	SOLID WASTE DISPL	GOVERNMENT	OTHER INCINERATOR
501006	SOLID WASTE	GOVERNMENT	FIRE FIGHTING
501007	SOLID WASTE DISPL	GOVERNMENT	SEWAGE TREATMENT
501900	SOLID WASTE DISPL	GOVERNMENT	AUX.FUEL/NO EMSNS
502001	SOLID WASTE DISPL	COMMERCL/INSTITNL	INCINERATION-GENL
502002	SOLID WASTE DISPL	COMMERCL/INSTITNL	OPEN BURNING
502003	SOLID WASTE DISPL	COMMERCL/INSTITNL	APARTMENT INCIN
502005	SOLID WASTE DISPL	COMMERCL/INSTITNL	INCINERATION-SPCL
502006	SOLID WASTE DISPL	COMMERCL/INSTITNL	LANDFILL DUMP
502900	SOLID WASTE DISPL	COMMERCL/INSTITNL	AUX.FUEL/NO EMSNS
503001	SOLID WASTE DISPL	INDUSTRIAL	INCINERATION
503002	SOLID WASTE DISPL	INDUSTRIAL	OPEN BURNING
503005	SOLID WASTE DISPL	INDUSTRIAL	INCINERATOR
503006	SOLID WASTE DISPL	INDUSTRIAL	LANDFILL DUMP
503007	SOLID WASTE DISPL	INDUSTRIAL	LIQUID WASTE
503008	SOLID WASTE DISPL	INDUSTRIAL	SURFACE IMPOUNDMT
503900	SOLID WASTE DISPL	INDUSTRIAL	AUX.FUEL/NO EMSNS

TABLE H-6. SOURCE CATEGORY CODES FOR U.S. AREA SOURCES

SCC	Category Description
001	Residential Fuel - Anthracite Coal
002	Residential Fuel - Bituminous Coal
003	Residential Fuel - Distillate Oil
004	Residential Fuel - Residual Oil
005	Residential Fuel - Natural Gas
006	Residential Fuel - Wood
007	Commercial/Institutional Fuel - Anthracite Coal
008	Commercial/Institutional Fuel - Bituminous Coal
009	Commercial/Institutional Fuel - Distillate Oil
010	Commercial/Institutional Fuel - Residual Oil
011	Commercial/Institutional Fuel - Natural Gas
012	Commercial/Institutional Fuel - Wood
013	Industrial Fuel - Anthracite Coal
014	Industrial Fuel - Bituminous Coal
015	Industrial Fuel - Coke
016	Industrial Fuel - Distillate Oil
017	Industrial Fuel - Residual Oil
018	Industrial Fuel - Natural Gas
019	Industrial Fuel - Wood
020	Industrial Fuel - Process Gas
021	On-Site Incineration - Residential
022	On-Site Incineration - Industrial
023	On-Site Incineration - Commercial/Institutional
024	Open Burning - Residential
025	Open Burning - Industrial
026	Open Burning - Commercial/Institutional
027	Light Duty Gasoline Vehicles - Limited Access Roads
028	Light Duty Gasoline Vehicles - Rural Roads
029	Light Duty Gasoline Vehicles - Suburban Roads
030	Light Duty Gasoline Vehicles - Urban Roads
031	Medium Duty Gasoline Vehicles - Limited Access Roads
032	Medium Duty Gasoline Vehicles - Rural Roads
033	Medium Duty Gasoline Vehicles - Suburban Roads
034	Medium Duty Gasoline Vehicles - Urban Roads
035	Heavy Duty Gasoline Vehicles - Limited Access Roads
036	Heavy Duty Gasoline Vehicles - Rural Roads
037	Heavy Duty Gasoline Vehicles - Suburban Roads
038	Heavy Duty Gasoline Vehicles - Urban Roads
039	Off Highway Gasoline Vehicles
040	Heavy Duty Diesel Vehicles - Limited Access Roads
041	Heavy Duty Diesel Vehicles - Rural Roads
042	Heavy Duty Diesel Vehicles - Suburban Roads
043	Heavy Duty Diesel Vehicles - Urban Roads
044	Off Highway Diesel Vehicles
045	Railroad Locomotives

(continued)

TABLE H-6 (continued)

SCC	Category Description
046	Aircraft LTOs - Military
047	Aircraft LTOs - Civil
048	Aircraft LTOs - Commercial
049	Vessels - Coal
050	Vessels - Diesel Oil
051	Vessels - Residual Oil
052	Vessels - Gasoline
054	Gasoline Marketed
055	Unpaved Road Travel
056	Unpaved Airstrip LTOs
057	Construction
058	Miscellaneous Wind Erosion
059	Land Tilling
060	Forest Wild Fires
061	Managed Burning - Prescribed
062	Agricultural Field Burning
063	Frost Control - Orchard Heaters
064	Structural Fires
066	Light Duty Gas Vehicles (ammonia)
067	Light Duty Gas Trucks (ammonia)
068	Heavy Duty Gas Trucks (ammonia)
069	Livestock Waste Management - Turkeys
070	Livestock Waste Management - Sheep
071	Livestock Waste Management - Beef Cattle
072	Livestock Waste Management - Dairy Cattle
073	Livestock Waste Management - Swine
074	Livestock Waste Management - Broiler Chickens
075	Livestock Waste Management - Other Chickens
076	Anhydrous Ammonia Fertilizer Application
077	Beef Cattle Feed Lots
078	Degreasing
079	Drycleaning
080	Graphic Arts (Printing)
081	Rubber and Plastics Manufacturing
082	Architectural Coating
083	Auto Body Repair
084	Motor Vehicle Manufacturing
085	Paper Coating
086	Fabricated Metals
087	Machinery Manufacturing
088	Furniture Manufacturing

(continued)

TABLE H-6 (continued)

SCC	Category Description
089	Flat Wood Products
090	Other Transportation Equipment Manufacturing
091	Electrical Equipment Manufacturing
092	Ship Building and Repairing
093	Miscellaneous Industrial Manufacturing
095	Miscellaneous Solvent Use
096	Minor Point Sources - Coal Combustion
097	Minor Point Sources - Oil Combustion
098	Minor Point Sources - Natural Gas Combustion
099	Minor Point Sources - Process Sources
100	Publicly-Owned Treatment Works (POTWs)
101	Cutback Asphalt Paving Operation
102	Fugitive Emissions From Synthetic Organic Chemical Manufacturing
103	Bulk Terminal and Bulk Plants
104	Fugitive Emissions From Petroleum Refinery Operations
105	Process Emissions From Bakeries
106	Process Emissions From Pharmaceutical Manufacturing
107	Process Emission From Synthetic-Fibers Manufacturing
108	Crude Oil and Natural Gas Production Fields
109	Hazardous Waste Treatment, Storage, and Disposal Facilities (TSDFs)

TABLE H-7. SOURCE CATEGORY CODES FOR CANADIAN AREA SOURCES

SCC	Category Description
11000	Stationary Fuel Combustion - Residential Natural Gas
11200	Stationary Fuel Combustion - Residential Natural Gas Liquids
11300	Stationary Fuel Combustion - Residential Kerosene and Stove Oils
11400	Stationary Fuel Combustion - Residential Coal
11510	Stationary Fuel Combustion - Residential Distillate Oil
11520	Stationary Fuel Combustion - Residential Residual Oil
11610	Stationary Fuel Combustion - Residential Conventional Wood Stove
11620	Stationary Fuel Combustion - Residential Slow Combustion Stove
11630	Stationary Fuel Combustion - Residential Fireplace
11640	Stationary Fuel Combustion - Residential Wood Furnace
12100	Stationary Fuel Combustion - Commercial/Inst Natural Gas
12200	Stationary Fuel Combustion - Commercial/Inst Liquid Petroleum Gas
12300	Stationary Fuel Combustion - Commercial/Inst Kerosene Stove Oil
12400	Stationary Fuel Combustion - Commercial/Inst Coal
12510	Stationary Fuel Combustion - Commercial/Inst Distillate Oil
12520	Stationary Fuel Combustion - Commercial/Inst Residual Oil
13100	Stationary Fuel Combustion - Industrial Natural Gas
13200	Stationary Fuel Combustion - Industrial Natural Gas Liquids
13300	Stationary Fuel Combustion - Industrial Kerosene and Stove Oils
13400	Stationary Fuel Combustion - Industrial Coal
13510	Stationary Fuel Combustion - Industrial Distillate Oil
13520	Stationary Fuel Combustion - Industrial Residual Oil
14100	Misc Power Generation - Natural Gas
14200	Misc Power Generation - Heavy Fuel Oil
14300	Misc Power Generation - Light Fuel Oil
14400	Misc Power Generation - Misc Diesel Generator
21000	Gasoline Vehicles - Automobiles
21100	Gasoline Vehicles - Light Duty Trucks
21200	Gasoline Vehicles - Heavy Duty Trucks
21300	Diesel Vehicles - Light Duty Vehicles
21400	Diesel Vehicles - Heavy Duty Vehicles
22100	Off-Road Gasoline Vehicles - General
22140	Off-Road Gasoline Vehicles - Snowmobiles
22210	Off-Road Diesel Vehicles - Agricultural
22220	Off-Road Diesel Vehicles - Construction
22230	Off-Road Diesel Vehicles - Mining
22240	Off-Road Diesel Vehicles - Manufacturing
22250	Off-Road Diesel Vehicles - Forestry
22260	Off-Road Diesel Vehicles - Public Administration
22270	Off-Road Diesel Vehicles - Pipeline
23110	Off-Highway Mobile Sources - Jet Aircraft
23120	Off-Highway Mobile Sources - Turboprop Aircraft
23130	Off-Highway Mobile Sources - Piston Engine Aircraft

(continued)

TABLE H-7. (Continued)

SCC	Category Description
23140	Off-Highway Mobile Sources - Helicopter
23150	Off-Highway Mobile Sources - Small Piston Aircraft
24100	Off-Highway Mobile Sources - Railroad Diesel Oil
25110	Off-Highway Mobile Sources - Motorships Dockside
25120	Off-Highway Mobile Sources - Steamships Dockside
25210	Off-Highway Mobile Sources - Motorships Underway
25220	Off-Highway Mobile Sources - Steamships Underway
25310	Off-Highway Mobile Sources - Gasoline Outboards
27110	Gasoline & Diesel Mkting - Refining Storage Transfer
27111	Gasoline & Diesel Mkting - Filling Vehicle Tanks
27120	Gasoline & Diesel Mkting - Diesel Evaporation
27130	Gasoline & Diesel Mkting - Station Storage Transfer
27140	Gasoline & Diesel Mkting - Vapor Loss at Station (Tank)
27150	Gasoline & Diesel Mkting - Transfer to Cars
27160	Gasoline & Diesel Mkting - Spillage at Station
31300	Solid Waste Incineration - Multiple Chamber
31500	Solid Waste Incineration - Controlled Air
32100	Solid Waste Incineration - Wood Waste Disposal
33100	Slash Burning
47100	Forest Fires
47200	Structural Fires
51000	Bakeries
52110	Crude Oil Production - Evaporation of Hydrocarbons
53110	Clay Products Manufacturing - Dryer/Grinder
53120	Clay Products Manufacturing - Storage
53200	Coal Industry - Coal Mining
53210	Coal Industry - Coal Handling
53220	Coal Industry - Overburden Removal (Fugitive)
53300	Coal Industry - Transportation
53400	Mining & Rock Quarrying
53410	Mining & Rock Quarrying - Open Pit Mining
53420	Mining & Rock Quarrying - Overburden Removal
53430	Mining & Rock Quarrying - Underground Mining
53440	Mining & Rock Quarrying - Concentrate Dryers
53450	Mining & Rock Quarrying - Concentrate Transport
53500	Sand & Gravel Processing - General
53611	Stone Processing - Crushed Stone - Primary Crushing
53612	Stone Processing - Crushed Stone - Secondary Crushing
53613	Stone Processing - Crushed Stone - Conveying and Handling
53614	Stone Processing - Crushed Stone - Screening
53615	Stone Processing - Crushed Stone - Secondary Crushing (Fugitive)
53621	Stone Processing - Pulverized Stone - Primary Crushing
53622	Stone Processing - Pulverized Stone - Secondary Crushing

(continued)

TABLE H-7. (Continued)

SCC	Category Description
53624	Stone Processing - Pulverized Stone - Screening
53625	Stone Processing - Pulverized Stone - Fines Mill
53626	Stone Processing - Pulverized Stone - Storage Pile Losses
53627	Stone Processing - Pulverized Stone - Secondary Crushing (Fugitive)
53628	Stone Processing - Pulverized Stone - Recrushing
53631	Stone Processing - Building Stone - Cutting
54100	Asphalt Production - Drying
54200	Asphalt Production - Fugitive
55100	Concrete Batching
55200	Concrete Batching - Fugitive Material Handling
56000	Plastic Fabrication
57100	Wood Industry - Sawmill Production
57200	Wood Industry - Plywood and Veneer Production
57300	Wood Industry - Pulpboard Production
57400	Wood Industry - Hardwood Production
61110	Grain Milling/Handling - Terminal Elev - Shipping & Receiving
61120	Grain Milling/Handling - Terminal Elev - Transfer & Conveying
61130	Grain Milling/Handling - Terminal Elev - Cleaning
61140	Grain Milling/Handling - Terminal Elev - Drying
61150	Grain Milling/Handling - Terminal Elev - Headhouse
61160	Grain Milling/Handling - Terminal Elev - Tripper (Gallery Belt)
61210	Grain Milling/Handling - Terminal Elev - Shipping & Receiving
61220	Grain Milling/Handling - Terminal Elev - Transfer & Conveying
61230	Grain Milling/Handling - Terminal Elev - Headhouse
61240	Grain Milling/Handling - Terminal Elev - Tripper (Gallery Belt)
61310	Grain Milling/Handling - Process Elev - Receiving
61320	Grain Milling/Handling - Process Elev - Precleaning & Handling
61330	Grain Milling/Handling - Process Elev - Cleaning House
61340	Grain Milling/Handling - Process Elev - Millhouse
61410	Grain Milling/Handling - Priminal Elev - Shipping & Receiving
61420	Grain Milling/Handling - Priminal Elev - Transfer & Conveying
61430	Grain Milling/Handling - Priminal Elev - Headhouse
64000	Fertilizer Application
64100	Fertilizer Application - Ammonia Distributors
66100	Animal Waste - Cattle Dung
66200	Animal Waste - Pig Excrement
66300	Animal Waste - Sheep Manure
70000	General Solvent Use
71000	Dry Cleaning
77000	Application of Surface Coating - Trade/Sales Use
78200	Application of Surface Coating - Industrial Use
85100	Ferrous Foundries - Induction Furnace (Hot Melt)
85200	Ferrous Foundries - Cupola Furnace (Hot Melt)
85300	Ferrous Foundries - Electric Arc Furnace (Hot Melt)

APPENDIX I

FREDS MODIFICATIONS FOR CANADIAN DATA PROCESSING

For the 1985 NAPAP Emissions Inventory, Environment Canada provided EPA with an annual inventory of Canadian point and area source emissions. The files were manipulated into a format suitable for use as input to FREDS, and methodologies were developed to facilitate temporal, spatial, and species allocation of the data. While the FREDS input and peripheral files for Canada closely resembled those for the U.S., some notable differences remained. As a result, a separate set of FREDS source code was developed to process Canadian point and area sources. The remainder of this Appendix describes the modifications made to render FREDS capable of resolving the Canadian data into modeler's tapes.

HYDROCARBON PREPROCESSOR MODIFICATIONS

Canadian annual area source hydrocarbon values were reported as THC rather than VOC. Augmentation was therefore desired for aldehydes, but not for methane. It was not necessary to modify the HCPREP source code to accommodate this methodology; instead, an augmentation flag file (WTPCT) was created with all methane flags set to zero, allowing VOC to be calculated from THC rather than vice versa. The HCPREP Control Options File was set to read THC (SAROAD 43101) rather than VOC (SAROAD 43104), and execution proceeded normally. No change in preprocessing methodology was required for Canadian point sources.

MODEL DATA EXTRACTION MODULE MODIFICATIONS

The Canadian data included estimates of reactive alkaline particulate emissions (Na, K, Mg, Ca) in the annual file, in addition to TSP. Environment Canada requested that these annual particulate species be resolved by size fraction, rather than derive all PM species/size class combinations from total TSP. As a result, the four alkaline dust species were added as major pollutants in the MDEM Control Options File as ARNA, ARK, ARMG, and ARCA. The MDEM source code was altered to include these variables in the SAS DROP statement for creation of the split pollutant files (MAJMISC1 and MAJMISC2). In addition, all references to the variable COUNTY were removed from both the point and area source MDEM code, as this variable does not exist in the Canadian input files.

TEMPORAL ALLOCATION MODULE MODIFICATIONS

Canadian emissions data files were accompanied by separate files containing temporal fractions for point and area sources. These files, containing throughput percentages for months of the year, days of the week, and hours of the day, were reformatted into Canadian Temporal Factor Files similar to those used for the U.S. data. Emission records were linked to the temporal factors using a "year-week-day" code variable, YWD. Modifications to TAM, therefore, centered around linking emissions to temporal profiles based on YWD rather than other identifiers (e.g., SCC, State, or point ID code). The hierarchical process of merging temporal patterns at the SCC, State, and point level was abandoned in favor of a single-level merge by YWD. Canadian point source records did not contain operating schedules; therefore, the FREDS code pertaining to creation of temporal factors based on operating schedules was removed. In the absence of a valid YWD match, a uniform operating pattern was generated.

SPECIATION MODULE MODIFICATIONS

As mentioned previously, Canadian area source particulate data is provided in an annual speciated format, and requires only division into size classes. A suitable Speciation Factor File was developed for Canadian area sources using available data. Since some of the speciation factors equal unity, the SFF input format was changed in the SM macro SFFIN from "8.8" to "8.7" to account for the possibility of a non-zero digit to the right of the decimal. The area source SM Control Options File was modified to include RCA, RMG, RK, and RNA (reactive alkaline species emissions) as major pollutants to be subdivided.

SPATIAL ALLOCATION MODULE MODIFICATIONS

Canada provided EPA with spatial allocation data representing the 1981 base year; these data were preprocessed using NAPAP peripheral software to create the Canadian area source spatial factor file. Since the Canadian spatial data is at the province level rather than the county level, the program SAFP was modified to accommodate a maximum of 900 grids per province. Similarly, the size of the arrays NCOL, NROW and NSAF in SAM were increased from 160 to 900. All references to COUNTY were also dropped, including the input statement for the Spatial Allocation Factor File.

MODEL INPUT PREPROCESSOR MODIFICATIONS

The MIP source code required no modifications for Canadian data. The point source SAS-to-EBCDIC/ASCII code, however, was changed to remove the variables COUNTY and AQCR which have no Canadian analogs. The write format for the variable POINT_ID was increased from two to six characters to account for the difference in valid U.S. and Canadian point ID codes.

APPENDIX J

FREDS MODIFICATIONS FOR NATURAL SOURCES DATA PROCESSING

FREDS processing of U.S. natural source emissions data required minor modifications to three of the FREDS modules: MDEM, TAM, and SM. These were required as a result of differences in the emissions and allocation factor files, although many differences were accounted for in user specified control file options. Canadian natural source data utilized the same FREDS code implemented for processing Canadian anthropogenic area source data. A discussion of FREDS modifications for Canadian area source processing is given in Appendix I. Changes to MDEM, TAM, and SM for U.S. natural sources FREDS processing are discussed below.

MODEL DATA EXTRACTION MODULE MODIFICATIONS

The U.S. natural source emissions file contained five pollutants: TSP, Ca, Mg, K and Na. As a result, the data step for dividing the emissions into "THC/NO_x" and "TSP/SO_2" subfiles (MAJMISC1 and MAJMISC2, respectively) was no longer necessary. Additionally, variables referenced in this data step were not present in the natural source emissions file. Therefore, the data step and corresponding variables had to be eliminated from the MDEM code. The data step deleted is found in the main body of the program (after the macro SETUP is invoked) and creates MAJMISC1.DATA and MAJMISC2.DATA from MAJMISC.DATA. In addition, the variables THC_DEL and TSP_DEL referenced in the diagnostic report were also removed from the SAS code. For processing of the alkaline dust species, the variables ACA, AMG, AK, and ANA were included in the MDEM control file along with TSP.

TEMPORAL ALLOCATION MODULE MODIFICATIONS

TAM modifications for natural sources FREDS execution were required to process county-specific temporal factors. The area source TAM code allows only for processing of State- and SCC-specific temporal factors. To allow for county-specific factors, changes were made to the ASTAF and DETAIL macros and to the main body of the program for output of the summary report. Specific code changes to the ASTAF macro are given below.

1. DATA SCCTAF(DROP=STATE) STATAF;
   Changed to:
   DATA SCCTAF(DROP=STATE COUNTY) STTAF(DROP=COUNTY) CNTYTAF;

2.
```
IF STATE NE . THEN OUTPUT STATAF;
ELSE OUTPUT SCCTAF;
Changed to:
IF COUNTY NE . THEN OUTPUT CNTYTAF;
ELSE IF STATE NE . THEN OUTPUT STATAF;
ELSE OUTPUT SCCTAF;
```

3. Add the following data step before the STATE.DATA TEMP.NOSTATE&MISS data step:

```
DATA CNTY.DATA TEMP2.NOCNTY&MISS;
MERGE CNTYTAF(IN-IN2) TAMIN.&SASMEM(IN-IN1) END-EOF;
   BY SCC STATE COUNTY;
%GLOBAL INCTYTAF;
IF _N_-1 THEN INCTYTAF-0;
IF IN1 AND IN2 THEN DO;
   INCTYTAF+1; OUTPUT CNTY.DATA;
END;
ELSE IF IN1 THEN OUTPUT TEMP2.NOCNTY;
IF EOF THEN DO;
   CALL SYMPUT('INCTYTAF',INCTYTAF);
END;
```

4.
```
MERGE STTAF(IN-IN2) TAMIN.&SASMEM(IN-IN1) END-EOF;
Changed to:
MERGE STTAF(IN-IN2) TEMP2.NOCNTY(IN-IN1) END-EOF;
```

5.
```
SET STATE.DATA SCC.DATA;
Changed to:
SET CNTY.DATA STATE.DATA SCC.DATA;
```

For the detailed report, the statement "IF FIRST.STATE" was changed to "IF FIRST.COUNTY". For the summary report, the variable INCTYTAF was included with the processing summaries for INSTATAF, INSCCTAF, and UNITAF.

SPECIATION MODULE MODIFICATIONS

Modifications to SM for natural source emissions data speciation required a change in the input format for the Speciation Factor File. In the macro SFFIN, the statement "INPUT TSF 8.8 @;" was changed to "INPUT TSF 8.7 @;". It should be noted that this statement occurs three times in the SFFIN macro.